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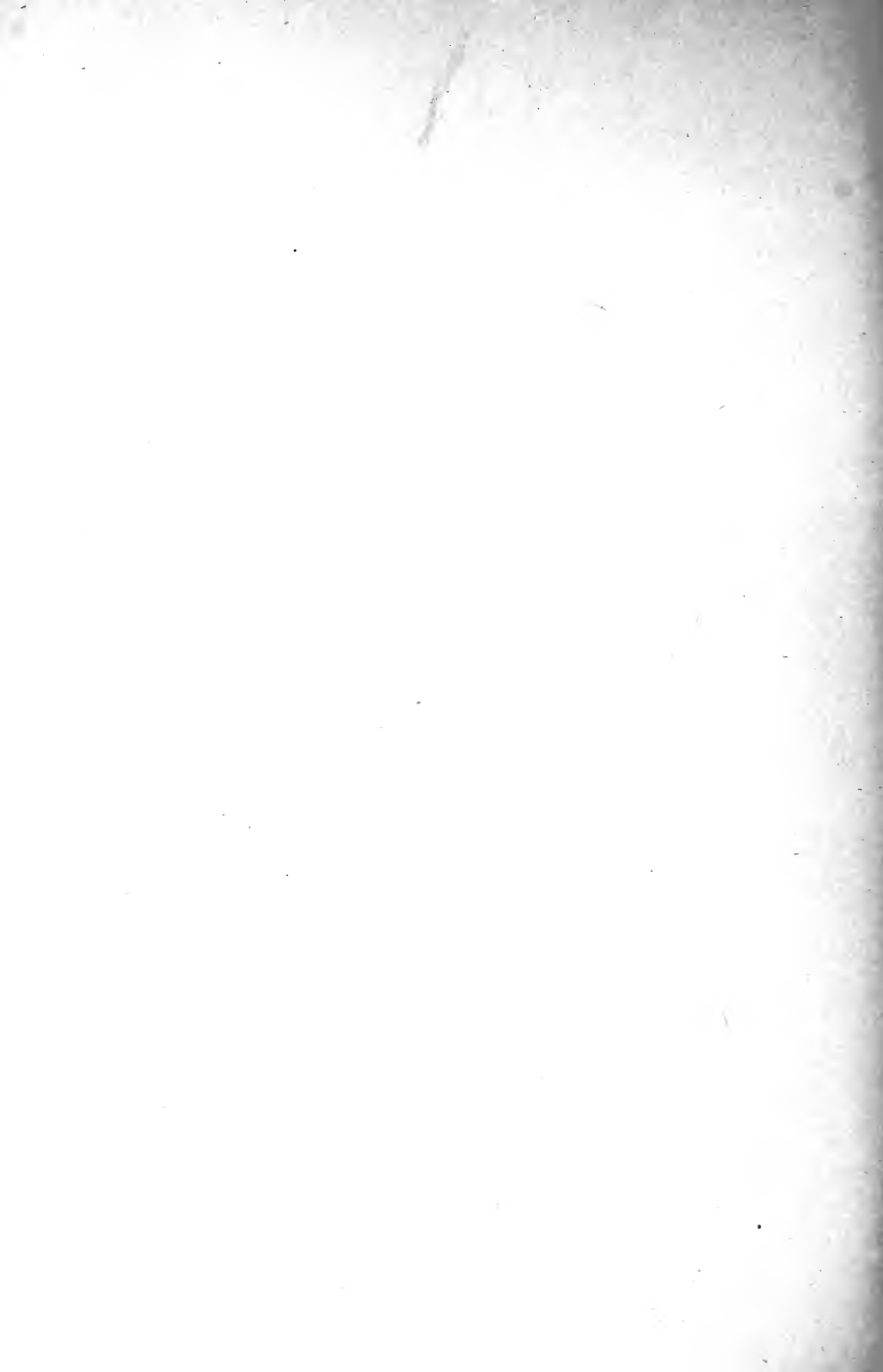
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FASCICULI
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PART II
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FASCICULI MALAYENSES

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ANTHROPOLOGICAL AND ZOOLOGICAL RESULTS OF AN EXPEDITION
TO PERAK AND THE SIAMESE MALAY STATES, 1901-1902

UNDERTAKEN BY
NELSON ANNANDALE AND HERBERT C. ROBINSON

UNDER THE AUSPICES OF THE UNIVERSITY OF EDINBURGH AND
THE UNIVERSITY OF LIVERPOOL

ZOOLOGY

PART II

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NON-OPERCULATE PULMONATA

BY

WALTER E. COLLINGE, M.Sc.

THE UNIVERSITY, BIRMINGHAM

INTRODUCTORY NOTE

NO particular attention was paid to the collection of Mollusca either by Mr. ANNANDALE or myself, and, as has been noted previously, the drought that prevailed during a great portion of our stay in the Siamese Malay States was very unfavourable to most forms of invertebrate life. The majority of our collecting stations, moreover, were situated on granite, where the molluscan fauna is naturally poor, but the limestone hills and caves in the vicinity of Biserat would probably afford a rich harvest if carefully searched during the rainy season. The districts covered by the 'Skeat' Expedition and ourselves in the Eastern States were, to all intents and purposes, identical, and the fact that out of thirty-eight species in the two lists only one is common to both, shows that on the Eastern side of the Peninsula, at any rate, almost everything remains to be done in this branch of zoology ; though on the west coast our knowledge is much more complete owing to the researches of STOLICZKA, GODWIN-AUSTEN, DE MORGAN, and MOELLENDORF.

HERBERT C. ROBINSON

REPORT ON THE NON-OPERCULATE LAND MOLLUSCA

By WALTER E. COLLINGE, M.Sc.

THE UNIVERSITY, BIRMINGHAM

THE collection of Non-Operculate Land Molluscs made by Messrs. ANNANDALE and ROBINSON during 1901 and 1902 in the Malay Peninsula, and which has been placed in my hands for identification and description, is not a large one, and many of the species I have dealt with in my account of the Non-Operculate Land and Freshwater Molluscs collected by the members of the 'Skëat' Expedition in 1899 and 1900.¹ There are, however, a few species which were not obtained on this expedition, and these are of particular interest.

Firstly, I would mention the occurrence of a new species of *Damayantia*, ISSEL, which genus has not hitherto been recorded from elsewhere than Borneo; its distribution is thus extended considerably westward. A new species of *Parmarion*, P. FISCH., is described from Bukit Besar, while an example of *Helicarion lowi*, DE MORGAN, enables me to give some account of the anatomy, from which it will be seen that it can no longer be retained in that genus, but finds a more natural position in the genus *Nilgiria*, GODW.-AUST. Finally, a new species of *Atopos*, SIMR., offers an opportunity of further adding to our knowledge of the anatomy of this most interesting genus, though there yet remain many gaps.

In all, the collection comprises representatives of twenty-three species, which are contained in seventeen genera; of these, five species are new.

My best thanks are here tendered to the Council of the Birmingham Natural History and Philosophical Society for a grant towards the cost of the figures illustrating this work.

1. *Journ. of Malac.* 1902, vol. ix, pp. 71-95, pls. iv-vi.

DAMAYANTIA, Issel**1. *Damayantia minima***, sp. nov.

(Pl. XI, Figs. 1, 2)

Animal yellowish-brown, with a dark lateral band posteriorly, and an irregular black patch on the right side anteriorly. Mantle completely covers the shell; colour same as the body with three dark blotches in the middle. The dorsum is sharply keeled and lighter in colour. Rugae scarcely visible anteriorly, postero-laterally large and somewhat rhomboidal; absent on the mantle. Caudal mucous pore large and overlapped by the extremity of the tail. Peripodial groove faint. Foot-fringe yellowish-brown, lineoles absent; foot-sole same colour, with median and lateral planes.

Length (in alcohol), 12.5 mm.

Gedong, Batang Padang, South Perak.

Hitherto the genus has only been recorded from Borneo. The present species differs from *D. dilecta*, ISSEL, the type of the genus, in its smaller size, colour, absence of lineoles on the foot-fringe, the smaller mantle lobes, and the position of the visceral mass in relation to the body posterior to it.

PARMARION, P. Fisch.**2. *Parmarion malayana***, sp. nov.

(Pl. XI, Figs. 3, 4; Pl. XII, Figs. 11-13)

Animal fawn coloured, with faint dirty blue streak at each side of the dorsum postero-laterally. Mantle fawn coloured with irregular deep brown markings; keeled on the left side. Head marked by two prominent dark blue bands, which extend on to the bases of the upper tentacles. Rugae faint, small, and oval shaped. Peripodial groove distinct. Foot-fringe same colour as the body, with faint lineoles. Foot-sole dirty yellow, with median and lateral planes.

Length (in alcohol), 30 mm.

Shell oval in form, amber coloured, semi-transparent and membranous; whorls two-and-a-half; the first, which is very small, being calcareous. Maj. diam. 6.5; min. diam. 4 mm.

Bukit Besar, Nawngchik. 2,500 feet.

The Generative Organs (Pl. XII, Figs. 11-13).

The generative organs in general form agree with those of other Malayan species, there is one notable difference, however, viz., the penis does not

exhibit the beak-like distal end, common to so many species. The form of the species reminds one of this same organ in some species of *Girasia*, GRAY. The vestibule is wide, and leading into it in the middle portion is the vagina, a long, wide, spacious tube, which distally receives the short duct of the receptaculum seminis. The free oviduct is very short and scarcely differentiated from the common duct, which is thrown into a single fold and richly convoluted. The penis commences as a wide muscular tube, and at the point where the retractor muscle is inserted becomes bulbous, and makes a sharp turn upon itself, then gradually tapering passes into the vas deferens which joins the common duct on the opposite side to and just above the opening of the receptacular duct. Internally the lumen of the penis does not agree with the external form, agreeing in this character with the genus *Microparmarion*, SIMR. At the proximal end the penis is a fine canal which makes a bend to the right side and then to the left side, it is then continued as a fine tube to the region where the penis is folded upon itself; here it expands into a sac-like chamber which is connected by a tube-like portion with a further dilation, which latter gradually lessens in size, continuing on the ventral side of the organ, and ultimately passes into the vas deferens (Pl. XII, Fig. 12).

HELICARION, Fér.

3. *Helicarion permolle*, Stol.

Helicarion permolle, *Stol. J. A. S. B.* xlii, p. 18, pl. i, fig. 11; pl. ii, figs. 21-23 (1873).

Telôm, Perak-Pahang boundary. 4,000 feet.

ARIOPHANTA, Desmoulins

4. *Ariophanta janus* (Chem.)

Helix janus, *Martini and Cbemnitz, Conch. Cab.* xi, p. 307, figs. 3016, 3017.

Bukit Besar, Nawngchik. 2,500 feet.

NILGIRIA, Godw-Aust.

5. *Nilgiria lowi* (De Morgan)

(Plate XII, Figs. 14-16)

Helicarion lowi, *De Morgan, Bull. Soc. Zool. Fr.* x, p. 25, pl. i, figs. 3a-3d (1885).

From a single alcoholic specimen collected at Bukit Besar (3,000 feet), I am able to give the following particulars. The animal is a deep chrome yellow,

with dark-blue or greenish-blue blotches ; the head and tenacles are also a dark greenish-blue colour. The peripodial groove is well defined, and terminates below the large caudal mucous pore. The foot-fringe is yellow, marked with irregular blotches of blue ; the foot-sole a dirty yellow and marked by a shallow median groove, possibly due to the alcohol. The extremity of the foot terminates bluntly. The specimen measured 31 mm. in length, and the foot-sole 9 mm. in breadth. The shell was broken, but at least a third less than that described and figured by DE MORGAN. It has four whorls, and is thin and horn-coloured.

This species can no longer be retained in the genus *Helicarion*, FÉR., which seems to be a repository to certain authors for all thin semi-transparent shells of three or four whorls. It is closely related to certain species of *Ariophanta*, in which the dart is represented by a small simple muscular organ, and for such I would suggest that the name of *Nilgiria*, GODW.-AUST., should be retained.

The Rev. Professor H. M. GWATKIN has very kindly examined a mounted specimen of the radula, which I sent him, and he states that he sees no reason why the species should not be referred to *Ariophanta*, though, as he points out, the genus is by no means in a satisfactory state.

The Generative Organs (Pl. XII, Figs. 14-16).

The vestibule is a wide sac-like pouch, into which the penis and dart-sac open at the right and left sides opposite to one another, while posteriorly is the opening of the vagina. The receptaculum seminis is a wide tubular sac, and of considerable length. The free-oviduct, common duct, and albumen gland call for no special mention. The penis is a long thick muscular organ, with a definite epiphallus and kalk sac, the vas deferens joining it just below this latter organ. The retractor muscle is inserted at the distal end of the penis, at which point the latter organ exhibits a slight enlargement. Internally there is a large long penis which distally exhibits a peculiar spongy-like cap or covering (Pl. XII, fig. 16) ; this specimen was in only poor condition, and I was therefore unable to make out the structure as clearly as I should have liked. The dart gland and dart sac are of the usual form, and in the latter there is present a small muscular papilla very similar to those present in other species of *Nilgiria*.

EUPLECTA, Semper

6. Euplecta bijuga (Stol.)

Rotula bijuga, *Stol. J. A. S. B.* xlii, p. 14, pl. i, figs. 4-7 ; pl. ii, figs. 16-18 (1873).

Bukit Besar, Nawngchik. 3,000 feet.

7. Euplecta, sp.

Bukit Jalor, Jalor. 300 feet.

MACROCHLAMYS, Bens.**8. Macrochlamys resplendens** (Philippi)

Helix resplendens, *Philippi, Zeitschr. f. Malac.* 1846, p. 192.

Macrochlamys (?) *resplendens*, *Godw.-Aust. Moll. of India*, p. 109, pl. xxvi, figs. 1-3 (1883).

Bukit Besar, Nawngchik. 3,000 feet.

Three very fine specimens, the largest of which measures 23 mm. max. diam.

9. Macrochlamys hardwickei, Godw.-Aust.

Macrochlamys hardwickei, *Godw.-Aust. Moll. of India*, p. 105 (1883).

Cape Patani, Jhering.

HEMIPLECTA, Albers.**10. Hemiplecta sakaya** (De Morgan)

Oxytes sakaya, *De Morgan, Bull. Soc. Zool. Fr.* x, p. 32, pl. vi, figs. 1a-1c (1885).

Hemiplecta sakaya, *Mllddf. P.Z.S.* 1891, p. 334.

Bukit Besar, Nawngchik. 2,500 feet.

11. Hemiplecta salangana, v. Marts.

Nanina (*Hemiplecta*) *salangana*, v. *Marts. Conch. Mitth.* 11, p. 134, pl. xxv, figs. 8-12.

var. martensi, var. nov.

I am indebted to Professor E. VON MARTENS for very kindly comparing a shell from Bukit Besar with specimens of this genus in the collection in the Berlin Museum. He regards it as near to *H. salangana*, v. MARTS., from the island of Salanga or Junk Ceylon, on the north-west coast of the Malay Peninsula. It differs, however, from that species the type of which measures 44 mm. maj. diam., in its larger size being 52 mm., and a somewhat malformed specimen in which the sutures are very deep is 57 mm. It is also more darkly coloured and the umbilicus larger.

Mr. E. R. SYKES was good enough to compare it with specimens of *Hemiplecta* in the collection of the British Museum, and he informs me that there is one smaller specimen, unnamed, from Kelantan.

I have much pleasure in associating with this interesting variety the name of one of the distinguished Directors of the Berlin Museum, Professor E. VON MARTENS.

TROCHOMORPHA, Albers.

12. *Trochomorpha timorensis*, v. Marts.

Trochomorpha timorensis, v. Marts. *Preuss. Ost.-Asiat. Exped.* Bd. ii, p. 248 (1867); *Stoliczka, J. A. S. B.* xlii, p. 22, pl. i, fig. 17; pl. ii, figs. 10-12.

Bukit Besar, Nawngchik. 2,500 feet.

SITALA, A. Ad.

13. *Sitala infula* (?), Benson

Sitala infula, Benson, *Ann. Mag. Nat. Hist.* 1848, p. 160.

Bukit Besar, Nawngchik. 2,500 feet. One specimen.

This has the general outline of *S. Infula*, BENS., but the first five whorls have each a single well-marked spiral rib, while the last whorl has two.

There is a specimen of the same species (unnamed) in the British Museum, from Kelantan.

CHLORITIS, Beck.

14. *Chloritis malayana* (Mlldff.)

Helix (*Trachia*) *malayana*, Mlldff. *J. A. S. B.* lv, p. 303 (1886).

Chloritis malayana, Mlldff. *P.Z.S.* 1891, p. 335, pl. xxx, figs. 6, 6a.

Gedong, Batang Padang, South Perak.

This species was described by Dr. MOELLENDORFF, in 1886, as a *Trachia*, but later, in 1891, he removed it to the genus *Chloritis*, BECK. I must leave others, who are more conversant with the two genera, to decide as to which it belongs, but I should here like to point out the relationship, so far as the generative organs are evidence, between this species and *Trachia penangensis*, STOLICZKA.

The jaw is quadrant-shaped and exhibits twelve strong ribs, and one or two less distinct lateral ones. The radula is very similar to that of *T. Penangensis*, only the central tooth is larger, as also the laterals, and the basal plate smaller.

The Generative Organs (Pl. XII, fig. 17).

The vestibule is small and leads into a long wide vagina, distally, and on the right side the long receptaculum seminis opens into it; this organ is a thick muscular tube for the first two-thirds of its length, then follows a much thinner portion which terminates in a thin-walled sac, this latter is attached to the side of the common duct by a short muscle. The free-oviduct is very short and exhibits two well-marked constrictions, which divide it up into three bulbous portions. The common duct is richly folded on the oviducal side and of considerable width. The vas deferens is very long, and enters the penis on the right side of the latter organ, whose commencement is evident by the muscular sac-like head, from the end of which a small flagellum arises; the penis continues as a thin muscular tube for some distance, widening at the point where the retractor muscle is inserted, just beyond this there is a small caecal tube; the muscular wall is thickest about this region, beyond the penis gradually tapers to a very narrow tube. Internally its walls exhibit a series of well-marked plications and rugosities.

Compared with *Trachia penangensis*, STOL., the generative organs agree with those of that species in the general form of the male organ, excepting in the origin of the vas deferens, in the presence in both species of a caecal-like diverticulum of the penis, and a small flagellum at the distal end of that organ, and in the elongate receptaculum seminis and vagina.

15. Chloritis hardouini (De Morgan)

Helix hardouini, *De Morgan, Le Naturaliste*, 1885, p. 68.

Philidora hardouini, *De Morgan, Bull. Soc. Zool. Fr.* x, p. 37, pl. i, figs. 10a-10d (1885).

Chloritis hardouini, *Mlldff. P.Z.S.* 1891, p. 335.

Bukit Jalor, Jalor. 300 feet.

AMPHIDROMUS, Albers.**16. Amphidromus perakensis**, Fult.

var. globosus, Fult., var. nov.

Biserat, Jalor.

'Common on tree trunks and on the leaves of wild bananas and ginger-worts. Known to the Malays as the "moon-snail" (*siput bulan*).'

I am indebted to Mr. HUGH FULTON, who has made a special study of this genus, for very kindly examining and identifying these shells. He writes

me that there is a certain amount of difference in the different shells. 'The columnellar lobe is as in *A. perakensis*, FULT.¹; it is evidently closely allied to that species, only differing in form. It is figured by PILSBRY² as a form of *leucoxanthus*, which he considers a variety of *aureus*, MARTYN. In my monograph I consider *leucoxanthus* as a variety of *perversus*, and I think the presence of a columnellar lobe in *perakensis*, and the present shells from Jalor, to be sufficient to separate them from *leucoxanthus*. I should propose calling your shells *perakensis*, var. or subspecies *globosus*.'

HAPALUS, Albers.

17. *Hapalus jousseaumei*, De Morgan

Hapalus jousseaumei, *De Morgan, Bull. Soc. Zool. Fr.* x, p. 24, pl. i, figs. 2a, 2c, (1885).

Bidor, Batang Padang, South Perak.

PROSOPEAS, Mörch.

18. *Prosopeas tchehelense*, De Morgan

Stenogyra tchehelensis, *De Morgan, Le Naturaliste*, 1885, p. 69; *id. Bull. Soc. Zool. Fr.* x, p. 40, pl. ii, figs. 7a, 7b (1885).

Telôm, Perak-Pahang boundary. 4,000 feet.

CLAUSILIA, Drap.

19. *Clausilia penangense*, Stol.

Clausilia (*Phaedusa*) *penangensis*, *Stol. J. A. S. B.* xlii, p. 27, pl. ii, figs. 4-6 and 15-17 (1873).

Bukit Besar, Nawngchik. 2,500 feet.

'Found on dead trees, feeding on fungi.'

20. *Clausilia kelantanense*, Sykes

Clausilia kelantanense, *Sykes, Journ. Malac.* ix, p. 22 and p. 61, pl. iii, fig. 1 (1902).

Bukit Besar, Nawngchik. 2,500 feet.

I have to thank Mr. E. R. SYKES for very kindly examining these shells, all of which, excepting one, he considers to be a variety of this species. He

1. *Journ. of Malac.*, 1901, viii, p. 194, pl. ix, figs. 8-10.

2. *Tryon's Manual*, xiii, pl. 54, figs. 76, 77.

further informs me that the shells which he recorded from Kelantan as *C. filicostata*, STOL.,¹ are really very close to this variety, and that he was wrong in referring them to *C. filicostata*, having been misled by wrongly named shells.

ATOPOS, Simr.

21. *Atopus maximus*, sp. nov.

(Pl. XI, Figs. 5, 6; Pl. XIII, Figs. 18-23)

Colour of the notum yellowish with slatey-blue mottling, and an irregular yellowish-brown band laterally, granulated, and minutely spotted with black, notum extends over the head in a hood-like manner; head white, facial region blue. Perinotum white; foot-sole (in alcohol) drab colour; keel distinct but not prominent.

Length of notum (in alcohol), 130 mm.; breadth, 24 mm.; height, 24 mm. Breadth of foot-sole, 12 mm. Female generative orifice about 20 mm. from the male generative orifice.

Bukit Besar, Nawngchik. 2,500 feet.

This is the largest and finest example of the genus I have seen, and my only regret is that more specimens were not met with. In life the animal is a slatey blue with a bright salmon-pink foot-sole. In all probability it is referable to the sub-genus *Padangia*, BABOR.

The Alimentary Canal (Pl. XIII, figs. 18-20).

The buccal cavity is large and may conveniently be divided into an anterior portion in front of the opening of the oesophagus, and a posterior portion behind the oesophageal opening. At the extreme posterior end there is a short stout muscle. The oesophagus passes from the dorsal side of the buccal cavity to the left, then making a short bend beneath the posterior portion of that organ it passes on the left side as a narrow tube into the substance of the 'liver' or mid-gut gland. At the point where the oesophagus opens into the cavity of the gland two other wide short ducts also open. Internally, the mid-gut gland is seen to be an irregular shaped cavity with a series of fine canals and irregular spaces, radiating from the main chamber. These are, perhaps, best seen in a series of transverse sections (Pl. XIII, Figs. 19, 20). The representation in Fig. 18 is purely diagrammatic. In this specimen the main chamber was perfectly empty, but amongst the contents of a smaller example I had no difficulty in identifying hyphae and spores of fungi, other vegetable matter, and particles of animal matter.

1. *Journ. Malac.* ix, p. 61 (1902).

The Sarasins in their well-known work on the land mollusca of the Celebes state that they did not meet with material such as described by SIMROTH, viz., fragments of fungi and flesh, 'substances which in the case of a robber slug like *Atopos* we should be very surprised to find.' In spite of this statement I think Dr. SIMROTH is correct as to the nature of the food. In *A. sarasini*, CLLGE., I had no difficulty in making out the contents, or in the above mentioned specimen of *A. maximus*.

Our knowledge of the habits of this interesting genus are peculiarly meagre. From the nature of the teeth of the radula one might suppose that the members of the genus lived, like the Testacellidae, beneath the surface, frequenting the burrows of earthworms, but from the preponderance of vegetable matter in the contents of the mid-gut gland, and from the fact that they have, I believe in all cases, been found among decaying vegetable matter, it would seem to point to the fact that they do not live beneath the surface to the same extent, if at all.

The Generative Organs (Pl. XIII, figs. 21, 22).

In general form the generative organs resemble those of *A. sarasini*, CLLGE., the female organs I was able to trace in some detail, but those of the male still remain a puzzle. Commencing as a simple wide tube the vagina receives, at its distal end, the duct of the receptaculum seminis, which latter body is a small spherical sac. Beyond this point the lumen of the tube widens and the wall thickens, here being thrown into a U-shaped fold, continuing as a much narrower tube it suddenly becomes thrown into a series of closely packed coils, which are partly imbedded in the large albumen gland. Passing from the end of the common duct is a short, fairly wide tube, which is connected with a large glandular body; clearly the homologue of the much smaller gland, which in *A. sarasini* I have termed the ovary. The penis is very like that in *A. sarasini* only longer and slightly different externally. The duct lies quite close to the wall of the sheath of the penis. I succeeded in tracing it to about the lower third of the right Simroth gland, where it seemed to terminate on the wall. Both the Simroth glands were well developed and exhibit the usual characters.

The Pedal Gland (Pl. XIII, fig. 23).

This is a large muscular looking organ, measuring 43 mm. in length, and 3 mm. in breadth anteriorly, and 5 mm. posteriorly.

'The Patani Malays confuse the slugs of this genus with the two species of *Eoperipatus* that were found in the Siamese Malay States by the "Skeat" Expedition, calling both *ulat chalawa*, though certain of the slugs are also

called *ulat jelôntong*, because their colour is supposed to resemble that of the monkey known as *lôntong* (*Presbytes obscurus*). The confusion is to some extent justified by a certain resemblance in form, in the apparent texture of the integument, and in type of coloration, though the dorsal surface of the commoner species of the Molluscan genus is dark slaty blue, while that of the Peripati found in the Malay Peninsula is chocolate brown. The movements of the two genera, widely separated as are their organs of progression, are not so dissimilar to the eye, especially in the uncertain light of the jungle, as might be expected, and on one occasion I was quite deceived myself, exclaiming that we had found Peripatus at last on seeing *Atopos* moving, with some rapidity, across a jungle path in the early morning. Slugs of the genus under discussion are frequently found in the centre of rotten tree-trunks, in a dry, stiff, retracted, and apparently torpid condition, and though *Eoperipatus* is found in very much the same environment, the retraction of the molluscs' tentacles reduces their resemblance to the Arthropod to a minimum. Both Peripatus and slugs resembling it are said by the Malays to be so poisonous that if a drop of their slime, which is very scanty in the latter, and is, of course, ejaculated from certain large glands in the former, falls on a man's limb it will cause it to rot off. The slugs are sometimes calcined and their ashes rubbed on the horns of fighting bulls, under the belief that even a scratch from a horn so treated will cause the bull's opponent to fall down dead.' N.A.

The distribution of *Atopos* in the Malay Peninsula seems very anomalous. The genus was originally described from the Philippines, and species referred to it are also known from Amboina, Celebes, West Sumatra, and Cochin China, while several species beside the present one have been described from the Eastern Malay States.¹ But curiously enough, with the exception of one from Penang (and this locality, like that of 'Malacca,' often covers a very wide area, indeed), no species has ever been met with on the western side of the Peninsula. The State of Perak has been fairly well explored by malacologists, and if they existed it is highly improbable that such large and conspicuous forms as the species of *Atopos* are would have escaped notice. I searched for them myself in environments precisely similar to those in which they were found on Bukit Besar, but in every case without success.

A parallel instance may be mentioned among birds, for the barbet, *Thereiceryx lineata* (VIELL), is known from the Burmese countries, Siam, Cochin China, Patani, and Pahang, reappearing in Java, but has never been met with on the western side of the Peninsula.—H. C. R.

1. Collinge, *Journ Malac.*, IX, p. 87 *et seq.* (1902). The genus has recently been found in North-west Borneo. See *Journ. Malac.* X, p. 82 (1903). W. E. C.

VERONICELLA, Blainv.**22. Veronicella**, sp.

(Pl. XI, Figs. 7, 8)

Animal yellowish-white or creamy yellow dorsally, with minute black speckles and a medio-dorsal yellowish-white stripe. Hyponotum same colour ; foot-sole a dirty yellow, marked by fine, closely set, transverse lines.

Length (in alcohol), 45 mm. ; foot-sole, 5.5 mm. broad ; hyponotum, 7 mm. broad. Female generative orifice on the right side, 3 mm. from the foot-sole ; 20 mm. from the right lower tentacle ; and 21.5 mm. from the posterior end of the body.

Bukit Besar, Nawngchik. 2,500 feet.

23. Veronicella, sp.

(Pl. XI, Figs. 9, 10)

Animal yellowish-brown with faint, minute, sepia coloured speckles, and a few black blotches, a narrow medio-dorsal stripe. Hyponotum same colour with a few sepia coloured blotches ; foot-sole a darker brown marked by fine, closely set, transverse lines.

Length (in alcohol), 42.5 mm. ; foot-sole, 5 mm. broad ; hyponotum, 8.5 mm. broad. Female generative orifice on the right side, 2.5 mm. from the foot-sole ; about 17.5 mm. from the right lower tentacle ; and 2.5 mm. from the posterior end of the body.

Gedong, Batang Padang, South Perak.

Having only a single example of each of these species I have thought it undesirable to name them until more material may be examined.

REFERENCE LETTERS

<i>alb. gl.</i>	Albumen gland.	<i>ov.</i>	Oviduct.
<i>b. c.</i>	Buccal cavity.	<i>p.</i>	Penis.
<i>c.</i>	Caecal cavity.	<i>pr.</i>	Prostate.
<i>cav.</i>	Cavity of digestive gland.	<i>R. S. gl.</i>	Right Simroth gland.
<i>d. gl.</i>	Dart gland.	<i>r.</i>	Rectum.
<i>d. s.</i>	Dart-sac.	<i>r. d.</i>	Receptacular duct.
<i>di. gl.</i>	Digestive gland.	<i>r. m.</i>	Retractor muscle.
<i>ep.</i>	Epiphallus.	<i>r. s.</i>	Receptaculum seminis.
<i>fl.</i>	Flagellum.	<i>s. d.</i>	Salivary duct.
<i>f. ov.</i>	Free-oviduct.	<i>s. gl.</i>	Salivary gland.
<i>h. d.</i>	Hermaphrodite duct.	<i>v.</i>	Vestibule.
<i>h. gl.</i>	Hermaphrodite gland.	<i>vg.</i>	Vagina.
<i>k. s.</i>	Kalk sac.	<i>v. d.</i>	Vas deferens.
<i>L. S. gl.</i>	Left Simroth gland.	<i>w. d. s.</i>	Wall of dart sac.
<i>o.</i>	Ovary.	<i>♀.</i>	Female generative orifice.
<i>oe.</i>	Oesophagus.		

EXPLANATION OF PLATES

Fig. 1.	<i>Damayantia minima</i> , sp. nov.	Right lateral view. x 2.
Fig. 2.	" "	Dorsal view. x 2.
Fig. 3.	<i>Parmarion malayana</i> , sp. nov.	Right lateral view. x $1\frac{1}{2}$.
Fig. 4.	" "	Dorsal view. x $1\frac{1}{2}$.
Fig. 5.	<i>Atopos maximus</i> , sp. nov.	Right lateral view. x 1.
Fig. 6.	" "	Ventral view. x 1.
Fig. 7.	<i>Veronicella</i> , sp.	Dorsal view. x 1.
Fig. 8.	" "	Ventral view. x 1.
Fig. 9.	<i>Veronicella</i> , sp.	Dorsal view. x 1.
Fig. 10.	" "	Ventral view. x 1.
Fig. 11.	<i>Parmarion malayana</i> , sp. nov.	Generative organs, enlarged.
Fig. 12.	" "	" " "
Fig. 13.	" "	Dart. x 17.
Fig. 14.	<i>Nilgiria lowi</i> (De Morgan).	Generative organs, enlarged.
Fig. 15.	" "	The dart-sac dissected to show the muscular papilla.
Fig. 16.	" "	Cap-like terminal portion of the penis.
Fig. 17.	<i>Chloritis malayana</i> (Mildff.).	Generative organs, enlarged.
Fig. 18.	<i>Atopos maximus</i> , sp. nov.	Alimentary canal showing in a semi-diagrammatic manner the digestive or mid-gut gland.
Fig. 19.	" "	Transverse section of the anterior part of digestive gland.
Fig. 20.	" "	Transverse section of the posterior part of digestive gland.
Fig. 21.	" "	The male generative organs and Simroth glands.
Fig. 22.	" "	The female generative organs.
Fig. 23.	" "	The Pedal gland. x 2.

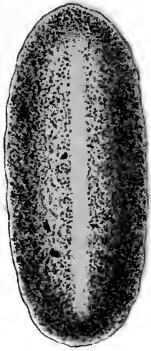


Fig. 7.



Fig. 1.

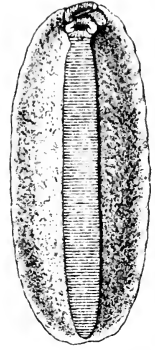


Fig. 8.



Fig. 2.

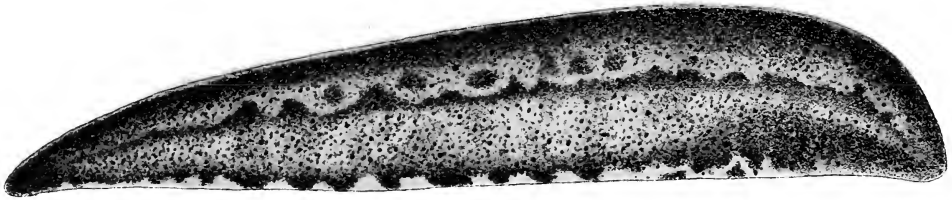


Fig. 5.

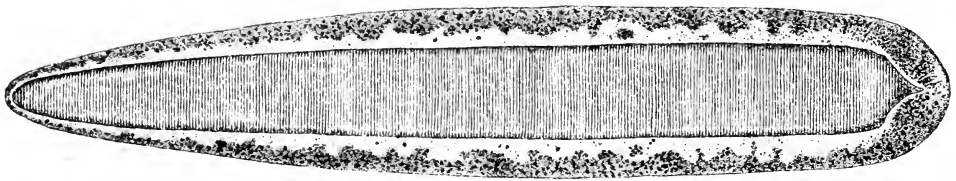


Fig. 6.



Fig. 3.



Fig. 9.



Fig. 4.

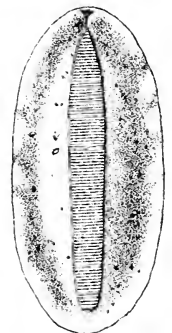


Fig. 10.

M.P.Parker. del et pinxt ad nat.

T.N. Latham. lith.

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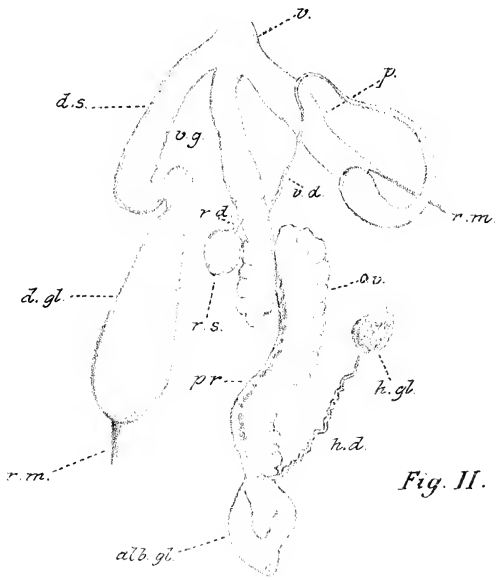


Fig. 11.

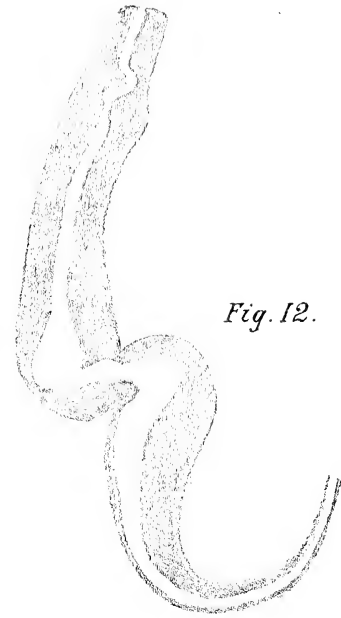


Fig. 12.

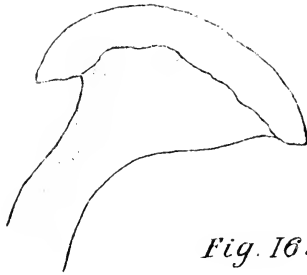


Fig. 16.



Fig. 13.

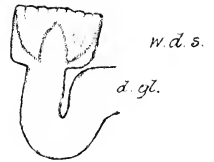


Fig. 15.

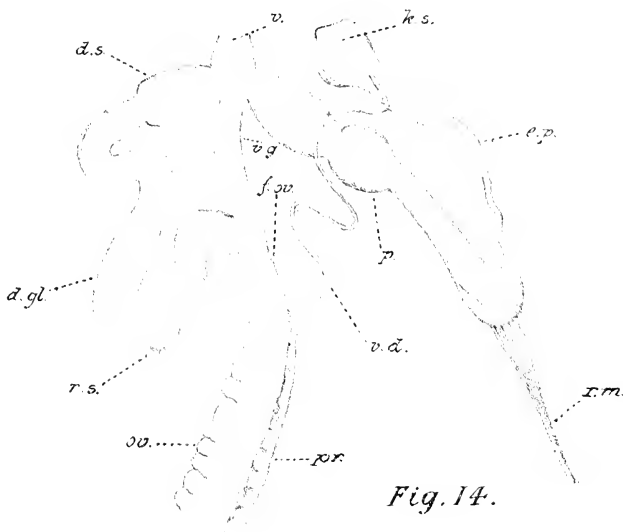


Fig. 14.

W. E. C. del. ad nat.

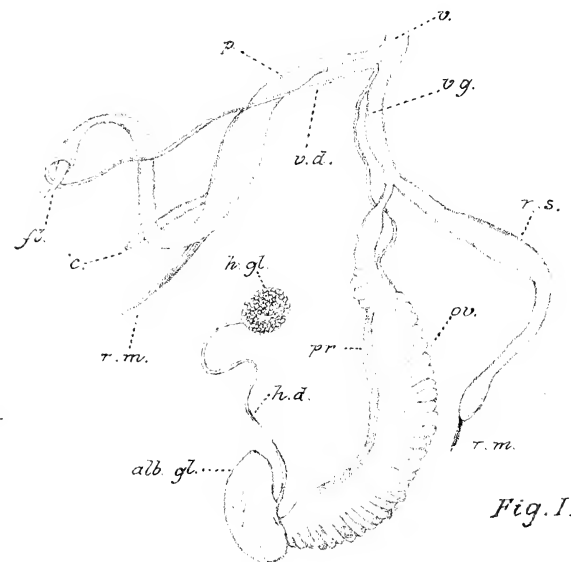


Fig. 17.

F. V. LATHAM, LITH.

Fig 18.

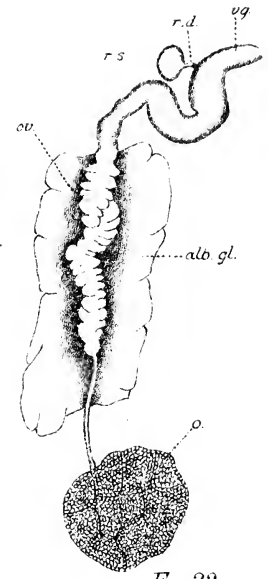
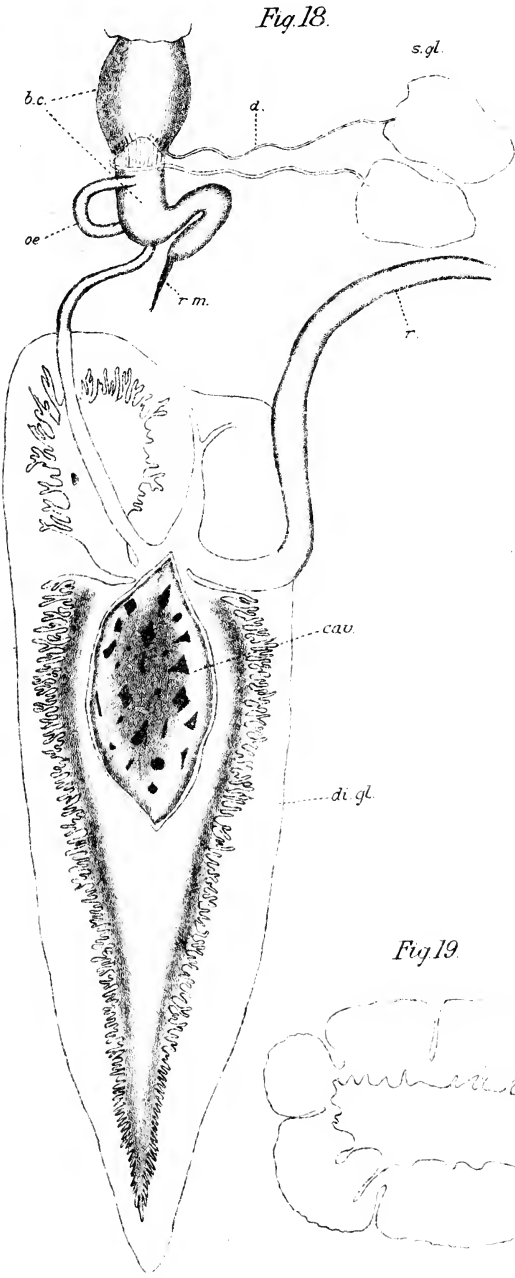


Fig 22.

Fig 23



Fig 19.

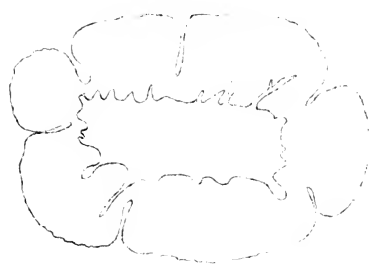


Fig 20.

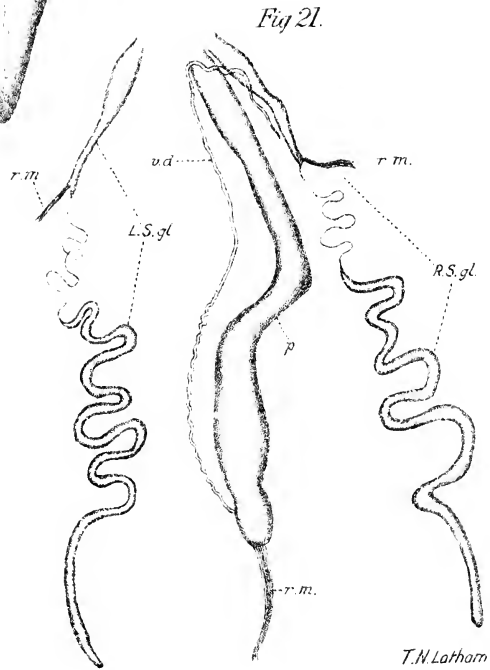


Fig 21.

W.E.C. del. ad nat.

T.N. Latham lith.



REPORT ON THE RHYNCHOTA

PART I. HETEROPTERA

BY W. L. DISTANT



INTRODUCTORY NOTE

THE majority of the specimens recorded in the present paper are from the Patani States, but some are from Perak and a few, for which Mr. ROBINSON is solely responsible, from Selangor. Mr. DISTANT remarks that a peculiarity of the collection is the poor representation of conspicuous forms. This is due to no scheme of the collectors, for we took all that we saw or that fell into our sweep-nets ; but it may be due, at any rate in part, to the fact that the nine months we spent in the Patani States were very dry and to the subsequent disappearance of the larger species, as the 'Skeat' collection, which was obtained in the same district in a very much wetter year, is particularly rich in conspicuous forms.

Another point of interest, not fully brought out in the paper, is the number of Heteroptera which resemble ants in appearance and movements. Unfortunately, the majority of such forms are immature, and Mr. DISTANT prefers not to express an opinion as to their identity ; some of them will be mentioned again in the notes added to Colonel BINGHAM's Report on the Aculeate Hymenoptera, which is unavoidably postponed for the present.

Mr. ROBINSON is mainly responsible for the editing of the report on the Heteroptera, but his departure for Malaya, to take up the curatorship of the State Museum at Kuala Lumpur, has obliged me to write this note.

NELSON ANNANDALE



REPORT ON THE RHYNCHOTA

PART I. HETEROPTERA

BY W. L. DISTANT

THIS very interesting collection of *Rhynchota*, made by Messrs. ANNANDALE and ROBINSON during their expedition to the Siamese Malay States and Perak, is remarkable under two aspects—firstly, by the absence of many well-known and common species; and secondly, by the presence of a large number of small, obscure, and little-known species. Owing to the first cause there is not sufficient material to enable any general conclusions to be formed on the geographical distribution of the *Rhynchota* found in this fauna; but, by its other character, I have been able to describe and figure a considerable number of new species and some new genera. A first set of all the specimens has been presented to the British Museum, and consequently the types representing the new diagnoses are to be found in the National Collection.

The *Hemoptera* will form the subject of a second Report.

HETEROPTERA

PENTATOMIDAE

PLATASPINAE

1. *Brachyplatys burmeisteri*

Brachyplatys burmeisteri, *Distant, Ann. Mag. Nat. Hist.* (5) iii, p. 46 (1879);
id. Faun. Brit. Ind. Rhynch. i, p. 12 (1902).

Thyreocoris silphoides, *Burm. (nec Fabr.) Handb.* ii, p. 384, 3 (1835).

Bukit Besar, Nawngchik. 2,500 feet. 3rd September, 1901.

‘From interior of trunk of dead palm tree.’

Common in Assam and also found in Java.

2. Coptosoma cribrarium

Cimex cribraria, *Fabr. Ent. Syst. Suppl.*, p. 531 (1798).

Tetyra cribraria, *Fabr. Syst. Rbyng.*, p. 143 (1803).

Thyreocoris cribraria, *Burm. handb.* ii (1), p. 384 (1825).

Coptosoma cribrarium, *Amy. and Serv. Hem.*, p. 66, t. 2, f. 4 (1843); *Stål., En. Hem.* v, p. 12 (1876); *Atkins. J.A.S.B.* lvi, p. 31 (1887); *Hist. Faun. Brit. Ind. Rbynch.* i, p. 22, fig. 11 (1902).

Coptosoma atomarium, pt. *Voll. Ind. Néerl.*, p. 50 (1863).

Coptosoma xanthochlora, *Walker, Cat. Het.* i, p. 87 (1867).

Bukit Besar, Nawngchik. 2,500 feet.

Found throughout British India and also received from China and Formosa.

3. Coptosoma duodecimpunctatum

Thyreocoris duodecimpunctatum, *Germ. Zeitschr.* i, p. 30 (1839); *Herr.-Schäff. Wanz. Ins.* v, p. 14, t. 150, f. 474 (1839).

Coptosoma duodecimpunctatum, *Dall. List Hém.* i, p. 62 (1851); *Stål. En. Hem.* v, p. 10 (1876); *Atkins. J.A.S.B.* lvi, p. 30 (1887); *Hist. Faun. Brit. Ind. Rbynch.* i, p. 19 (1902).

Ban Sai Kau, Nawngchik.

Biserat, Jalor.

8th July, 1901.

‘At Biserat this species was found in considerable numbers on the shoots of a species of acacia with honey glands growing in the open. When disturbed the head was folded beneath the thorax, and the insect attempted to fall to the ground. If prevented from doing this it readily took to flight.’

Found throughout British India and the Malay Peninsula.

4. Coptosoma pulchellum

Coptosoma pulchellum, *Montand. Ann. Mus. Civ. Gen.* xxxiv, p. 136 (1894); *Dist. Faun. Brit. Ind. Rbynch.* i, p. 28 (1902); *Vars.*, *distinctum*, *omnimundum*, *impeditum*, *Montand. Ann. Soc. Ent. Belg.* xl, pp. 118-119 (1896).

Sungkei, South Perak. February, 1902.

Found throughout British India and also recorded from Java and China.

5. Coptosoma siamicum

Coptosoma siamicum, *Walk., Cat. Het.* i, p. 89, 39 (1867); *Dist. Ann. Mag. Nat. Hist.* (7) viii, p. 240 (1901); *id. Faun. Brit. Ind. Rhynch.* i, p. 30 (1902).

Coptosoma concinnula, *bellula*, and *inclusa*, *Walker, loc. cit.*, pp. 94, 95.

Coptosoma saundersii, *Leth. and Sev. Cat. Gén. Hém.* t. i, p. 9 (1893).

Coptosoma sphaerula, pt. *Leth. and Sev. loc. cit.*, p. 9.

Coptosoma minima, *Atkins, J.A.S.B.* lvii, p. 342 (1889); *Kulg. Arch. f. Naturg.* 1901, p. 224.

Coptosoma pygmaeum, *Montand. Ann. Soc. Ent. Belg.* xl, p. 120 (1896); *Kulg. Arch. f. Naturg.*, 1901, p. 221.

Var.—

Coptosoma orbicula and *blandula*, *Walk., Cat. Het.* i, pp. 91, 96 (1867).

Coptosoma pygmaeum var. accensitum, *Montand. Ann. Soc. Ent. Belg.* xl, p. 447 (1896).

Biserat, Jalor.

Found throughout British India, and received from various islands of the Malayan Archipelago; also recorded from N. Australia.

6. Trepidotylus annandalei, sp. nov.

(Plate XV)

Above dark castaneous, speckled with ochraceous; head with the anterior areas of the lateral lobes, a spot at base, and another at inner margins of eyes, ochraceous; antennae ochraceous, apex of second joint and the whole of the third joint piceous, remainder multilobed; sternum greyish brown; abdomen beneath castaneous, its disk piceous; head beneath, rostrum, legs, and lateral margins of abdomen ochraceous; apex of rostrum piceous. Above punctate and faintly rugulose; head moderately long, margins convex, the central lobe very prominent and gibbous; second and third joints of antennae subequal in length; scutellum with the sub-basal transverse impression moderately well defined; lateral ochraceous margins of the abdomen inwardly broadly, obtusely angulate, each angle with a small castaneous spot.

Long 7 mm.; max. lat. $5\frac{1}{2}$ mm.

Bukit Besar, Nawngchik. 2,500 feet. 30th August, 1901.

‘In nest of small black ants, under leaf of a climbing ficus. It was surrounded by the ants, which appeared to be obtaining food from it.’ N.A.

SCUTELLERINAE

Elvisuraria

7. *Solenostethium rubropunctatum*

Scutellera rubropunctata, *Guér. Voy. Coq. Zool.* ii, p. 157 (1830).

Solenostethium rubropunctatum, *Dall. List Hem.* i, p. 7 (1851); *Atkins. J.A.S.B.* lvi, p. 147 (1887); *Dist. Faun. Brit. Ind. Rhynch.* i, p. 40, fig. 16 (1902).

Biserat, Jalor. 18th October, 1901.

Found throughout British India and also in Cambodia.

Scutelleraria

8. *Calliphara nobilis*

Cimex nobilis, *Linn. Cent. Ins.*, p. 17, 46 (1763); *id. Amoen.* 6, p. 400, 46 (1763).

Callidea nobilis, *Dall. List. Hem.* i, p. 32 (1851).

Calliphara nobilis, *Stål. En. Hem.* iii, p. 17 (1873); *Dist. Faun. Brit. Ind. Rhynch.* i, p. 53, fig. 23 (1902).

Cimex pustulatus, *Panz. in Voet. Col.* iv, p. 111, 11, pl. 47, f. 11 (1798).

Scutellera buquetii, *Guér. Voy. Coq. Ins.*, pp. 159 and 162 (1830).

Biserat, Jalor. 21st October, 1901.

‘From low shrubs in secondary jungle at base of limestone cliff.’

Found throughout Burma and Tenasserim, widely distributed in the Malayan Archipelago, and received from Hongkong and Formosa.

9. *Chrysocoris grandis*

Cimex grandis, *Tbunb. Nov. Ins. Sp.* ii, p. 31, t. 2, f. 46 (1783).

Calliphara grandis, *Germ. Zeitschr.* i, p. 128, 13 (1839).

Callidea grandis, *Dall. List Hem.* i, p. 23 (1851).

Chrysocoris (*Eucorysses*) *grandis*, *Stål. En. Hem.* iii, p. 18 (1873).

Chrysocoris grandis, *Dist. Faun. Brit. Ind. Rhynch.* i, p. 54 (1902).

Eucorysses superbus, *Uhler, Proc. Acad. Nat. Sci. Philad.*, 1860, p. 221.

Callidea distinguenda, *Uhler, loc. cit.*, 1861, p. 286.

Var. a—

Cimex baro, *Fabr. Ent. Syst. Suppl.*, p. 528, 7-8 (1798).

Tetyra baro, *Fabr. Syst. Rhyng.*, p. 129, 3 (1803).

Calliphara baro, *Germ. Zeitschr.* i, p. 127, 11 (1839).

Callidea baro, *Dall. List Hem.* i, p. 22, 3 (1851).

Tetrarthria tetraspila, *Walk. Cat. Het.* i, p. 19, 3 (1867).

Var. b—

Eucorysses pallens, *Amy. and Serv. Hém.*, p. 31, 1, pl. i, f. 4 (1843).

Callidea baro, *Voll. Faun. Ind. Néerl.* i, p. 17, 3 (1863).

Bukit Besar, Nawngchik. 28th August, 1901.

‘On the upper surface of the leaves of zingiberaceous plants.’

Found throughout British India and in China and Japan. The three specimens collected by Messrs. ANNANDALE and ROBINSON agree with the typical form of the species.

10. *Chrysocoris stollii*

Cimex stollii, *Wolff. Ic. Cim.* ii, p. 48, f. 45 (1801).

Callidea stollii, *Germ. Zeitschr.* i, p. 114, 7 (1839).

Chrysocoris stollii, *Stål. Hem. Fabr.* i, p. 11, 8 (1868); *Dist. Faun. Brit. Ind. Rhynch.* i, p. 58 (1902).

Scutellera stockerus, *Guér. Voy. Coq. Ins.*, p. 159, 5 and p. 161 (1830).

Callidea porphyricola, *Walk. Cat. Het.* i, p. 29, 19 (1867).

Ban Sai Kau, Nawngchik. 21st May, 1901.

Biserat, Jalor. 4th July, 1901.

‘Among long grass at the edge of jungle.’

Found throughout British India and recorded from Formosa and N. China.

11. *Chrysocoris ornatus*

Callidea ornata, *Dall. List Hem.* i, p. 27 (1851).

Chrysocoris ornatus, *Stål. En. Hem.* iii, p. 21, 19 (1873); *Dist. Faun. Brit. Ind.*

Rhynch. i, p. 59 (1902).

Bukit Besar, Nawngchik. 2,500 feet. April and May, 1901.

Also recorded from Assam and China.

12. *Chrysocoris eques*

Cimex eques, *Fabr. Ent. Syst.* iv, p. 79, 2 (1794).

Tetyra eques, *Fabr. Syst. Rhynch.*, p. 131, 13 (1803).

Scutellera eques, *Guér. Voy. Coq. Zool.*, p. 158, 3 (1830).

Callidea eques, *Burm. Handb.* ii (1), p. 394, 1 (1835); *Dall. List Hem.* i, p. 28 (1851).

Galostha eques, *Amy. and Serv. Hém.*, p. 33, 1 (1843).

Chrysocoris eques, *Stål. Hem. Fabr.* i, p. 11, 3 and p. 12, 12 (1868); *Atkins. J.A.S.B. lvi*, p. 179 (1887); *Hist. Faun. Brit. Ind. Rhynch.* i, p. 61 (1900).
Var. a—

Callidea schwaneri, *Voll. Faun. Ind. Néerl.* i, p. 26, 18, pl. 2, fig. 7 (1863).
Var. b—

Var. nicobarensis, *Atkins. Proc. A.S.B.*, 1887, p. 13.
Var. c—

Callidea formosa, *Westw. in Hope Cat. Hem.* i, p. 15 (1837).

Callidea dorsalis, *White in Gray's Zool. Misc.*, p. 80 (1842).

Bukit Besar, Nawngchik. 2,500 feet. May,
Biserat, Jalor. July and October, 1901.

‘From low shrub in secondary jungle at base of limestone cliff.’

Found throughout British India, and also in some of its varietal forms recorded from Java, Borneo, and China.

13. *Graptophora reynaudi*

Scutellera reynaudi, *Guér. Voy. Belang. Zool.*, p. 497, *Ins. pl. iv, f. 3* (1834);
Germ. Zeitschr. i, p. 136, 9 (1839).

Callidea reynaudi, *Dall. List Hem.* i, p. 27 (1851); *Voll. Faun. Ind. Néerl.* i,
p. 22 (1863).

Callidea pulchra, *Westw. in Hope Cat.* i, p. 16 (1837).

Calliphara pulchra, *Germ. Zeitschr.* i, p. 127, 10 (1839).

Bukit Besar, Nawngchik. 2,500 feet. 12th May, 1901.
Mabek, Jalor. 25th July, 1901.

Also recorded from several islands of the Malayan Archipelago.

Tetryaria

14. *Hotea curculionoides*

Pachycoris curculionoides, *Herr.-Schäff. Wanz. Ins.* iii, p. 106, f. 331 (1835).

Hotea curculionoides, *Dall. List Hem.* i, p. 39 (1851); *Stål. En. Hem.* iii,
p. 25 (1873); *Dist. Faun. Brit. Ind. Rhynch.* i, p. 65 (1902).

Pachycoris punctulatus, *Germ. Zeitschr.* i, p. 105, 48 (1839).

Hotea nasuta, *Walk. Cat. Het.* i, p. 58, 9 (1867).

Biserat, Jalor. 3rd to 5th July, 1901. (At light).

Widely distributed; found throughout British India, the Malayan Archipelago, and recorded from China.

'The resemblance between this bug and a species of weevil, which attacks the fruit of various mangos, is remarkable, and we have also taken the two species in the same environment, viz., among brushwood in the open; but both are inconspicuously coloured, resembling bark.'

GRAPHOSOMATINAE

15. *Podops coarctata*

Cimex coarctata, *Fabr. Ent. Syst. Suppl.*, p. 530, 44-5 (1798).

Scotinophora coarctata, *Stål. Hem. Fabr.* i, p. 21, 2 (1868).

Podops coarctata, *Hist. Faun. Brit. Ind. Rhynch.* i, p. 73, fig. 36 (1902).

Tetyra bispinosa, (pt.) *Fabr. Syst. Rhynch.*, p. 138, 48 (1803).

Podops spinosus, *nasalis*, and *exacta*, *Walk. Cat. Het.* i, pp. 73, 74 (1867).

Kuala Lumpur, Selangor. 23rd April, 1902. (At light).

Found nearly throughout British India, common in the Malay Peninsula and recorded from Java.

16. *Podops malayensis*, sp. nov.

(Plate XV)

Piceous-brown; head, anterior area of pronotum, and sternum, greyishly pilose; antennae, ochraceous, apical joint, excluding base, piceous; femora black, tibiae and tarsi stramineous; anterior and intermediate tibiae with their bases piceous, their apices pale castaneous; rostrum brownish, its apex piceous and reaching the posterior coxae; scutellum with a luteous spot near each basal angle; lateral margins of abdomen with small obscure ochraceous spots; stigmata piceous; first and second joints of antennae shortest and subequal in length, third, fourth, and fifth joints almost subequal; anterior pronotal angles ochraceous and horizontally extended; lateral margins concavely sinuate, lateral angles prominently obtusely spinous; abdominal segments laterally posteriorly obtusely spinous.

Length 6 to $6\frac{1}{2}$; exp. pronot. angl. $3\frac{1}{2}$ mm.

Bidor, South Perak. February, 1901. (At light).

Sungkei, South Perak. February, 1902. (At light).

17. *Aspidestrophus lineola*

Aspidestrophus lineola, *Voll. Faun. Ind. Néerl.* i, p. 44, 2, pl. III, f. 10 (1863); *Hist. Faun. Brit. Ind. Rhynch.* i, p. 80, fig. 40 (1902).

Bukit Besar, Nawngchik. 2,500 feet. 2nd September, 1901.

Also recorded from Assam, Burma, and S.E. Borneo.

CYDNINAE

18. *Cydnus indicus*

Cydnus indicus, *Westw. in Hope Cat.* i, p. 19 (1837); *Dist. Faun. Brit. Ind. Rhynch.* i, p. 90, fig. 46 (1902).

Æthus indicus, *Dall. List Hem.* i, p. 114 (1851); *Sign. Ann. Soc. Ent. Fr.* (6) ii, p. 28, t. 1, fig. 69 (1882); *Atkins. J.A.S.B.* lvi, p. 47 (1887).

Æthus perosus, *Stål. Öfv. Vet.-Ak. Förh.*, 1853, p. 214, 2.

Æthus impressicollis, *Sign. Ann. Soc. Ent. Fr.* (3) viii, p. 923 (1860).

Æthus ferus, *Walk. Cat. Het.* i, p. 163, 91 (1867).

Sungkei, South Perak. February, 1902. (At light).

Although this species is found in British India, it seems to be more widely distributed throughout the Malayan Archipelago; it has reached Australia, and is found in South Africa and Madagascar.

19. *Geotomus pygmaeus*

Æthus pygmaeus, *Dall. List Hem.* i, p. 120 (1851).

Geotomus pygmaeus, *Sign. Ann. Soc. Ent. Fr.* (6) iii, p. 51, t. 3, f. 160 (1883); *Dist. Faun. Brit. Ind. Rhynch.* i, p. 98, fig. 49 (1902).

Cydnus rarociliatus, *Ellenr. Nat. Tijdschr. Nederl. Ind.* xxiv, p. 139, f. 7 (1862).

Cydnus pallidicornis, *Voll. Faun. Ind Néerl. Pent.*, p. 17 (1868).

Æthus palliditarsus, *Scott, Trans. Ent. Soc. Lond.*, 1880, p. 309.

Geotomus subtristis and *jucundus*, *Buch. White, Ann. Mag. Nat. Hist.* (4) xx, pp. 110, 111 (1877).

Æthus nanulus and *platysomoides*, *Walk. Cat. Het.* i, pp. 162, 163 (1867).

Æthus omicron, *Walk., loc. cit.*, iii, p. 534 (1868).

Kampong Jalor, Jalor.

Widely distributed throughout British India and the Malayan Archipelago, found in China and Japan, and recorded from New Caledonia and Hawaii.

PENTATOMINAE

Halyaria

20. *Dalpada oculata*

Cimex oculatus, *Fabr. Syst. Ent.*, p. 703 (1775).

Dalpada oculata, *Dall. List Hem.* i, p. 184 (1851); *Dist. Faun. Brit. Ind. Rhynch.* i, p. 110, fig. 59 (1902).

Dalpada aspera, *Ellenr. Nat. Tijdschr. Nederl. Ind.* xxiv, p. 140, f. 8 (1862).

Dalpada nodifera and *indeterminata*, *Walk. Cat. Het.* i, pp. 222, 225 (1867).

Biserat (?), Jalor. June, July, October, 1901.

Mabek, Jalor. July, 1901.

'Among low vegetation on waste ground, also taken at light.'
Found throughout British India and the Malay Peninsula.

Dorpiaria

21. *Aednus obscurus*

Aednus obscurus, *Dall. List Hem.* i, p. 145, t. iii, f. 5 (1851); *Dist. Faun. Brit. Ind. Rhynch.* i, p. 133, f. 74 (1902).

Aednus similis, *Hagl. Stett. Ent. Zeit.* xxix, p. 154 (1868):

Sungkei, South Perak. February, 1902.

Found in Assam and Burma, common in the Malay Peninsula, and also recorded from a number of islands in the Malayan Archipelago.

Carpocoraria

22. *Halyomorpha picus*

Cimex picus, *Fabr. Ent. Syst.* iv. p. 115 (1794).

Edessa picus, *Fabr. Syst. Rhynch.*, p. 153 (1803).

Cimex marmoreus, *Fab. Ent. Syst. Suppl.*, p. 534 (1798).

Edessa marmoreus, *Fabr. Syst. Rhynch.*, p. 153 (1803).

Cimex cinnamomeus, *Wolff. Ic. Cim.* iii, p. 99, f. 93 (1802).

Halys timorensis, *Westw. in Hope Cat.* i, p. 22 (1837).

Pentatoma timorensis, *Dall. List Hem.* i, p. 242 (1851).

Halyomorpha timorensis, *Reise, Nov. Hem.*, p. 50 (1866).

Pentatoma halys, *Stål. Öfv. Vet.-Ak. Förb.*, 1855, p. 182.

Pentatoma trivialis, *Dohrn. Stett. Ent. Zeit.* xxi, p. 400 (1860).

Pœcilometis mistus, *Ubler. Proc. Acad. Nat. Sci. Philad.*, 1860, p. 223.

Dalpada brevis, *remota*, and *proxima*, *Walk. Cat. Het.* i, pp. 226, 227 (1867).

Halyomorpha picus, *Stål. En. Hem.* v, p. 75 (1876); *Dist. Faun. Brit. Ind. Rhynch.* i, p. 152, Fig. 91 (1902).

Sungkei, South Perak. February, 1902. (At light)

A common species throughout British India and Malaya and also found in China and Japan.

Eusarcocoriaria

23. *Sepontia variolosa*

Cœnina variolosa, *Walk. Cat. Het.* i, p. 82 (1867).

Sepontia variolosa, *Dist. Faun. Brit. Ind. Rhynch.* i, p. 165 (1902).

Biserat, Jalor. 14th October, 1901.

'In white-flowered shrub in secondary jungle, along with a very large number of other insects.'

Described from Burma.

24. *Eusarcocoris guttiger*

Cimex guttiger, *Tbunb. Nov. Ins. Sp.* ii, p. 32, t. 2, f. 47 (1783).

Stollia guttigera, *Stål. En. Hem.* v, p. 81 (1876).

Eysarcocoris guttigerus, *Dall. List. Hem.* i, p. 228 (1851).

Eusarcocoris, *Dist. Faun. Brit. Ind. Rhynch.* i, p. 165 (1902).

Pentatoma nepalensis and *punctipes*, *Westw. in Hope Cat.* i, p. 36 (1837).

Biserat, Jalor. 5th July, 1901. (At light).

Found throughout British India, reported from China, common in Japan.

25. *Eusarcocoris aenescens*

Hoplistodera aenescens, *Walk. Cat. Het.* ii, p. 266 (1867).

Eusarcocoris aenescens, *Dist. Faun. Brit. Ind. Rhynch.* i, p. 166 (1902).

Bukit Besar, Nawngchik. 2,500 feet.

Mabek, Jalor. 27th July, 1901.

Also recorded from Tenasserim and found in Borneo.

26. *Carbula trabifera*

Carbula trabifera, *Bredd. Stett. Ent. Zeit.*, 1890, p. 302.

Bukit Besar, Nawngchik. 2,500 feet.

Telôm, Perak-Pahang border. 4,000 feet. January, 1902.

Described from Sumatra.

Hoplistoderaria

27. *Paracritheus trimaculatus*

Scutellera trimaculatus, *Lep. and Serv. Enc. Meth.* x, p. 411 (1825).

Graphosoma trimaculatus, *Germ. Zeitschr.* i, p. 54 (1839).

Hoplistodera trimaculata, *Dall. List. Hem.* i, p. 217 (1851).

Astyanax trimaculatus, *Stål. Öfv. Vet.-Ak. Förh.*, 1870, p. 629.

Paracritheus trimaculatus, *Dist. Faun. Brit. Ind. Rhynch.* i, p. 178 (1902).

Biserat, Jalor. 19th October, 1901.

Common in the Malay Peninsula, and found in many islands of the Malayan Archipelago.

28. *Stachyomia luteovaria*, sp. nov.

(Pl. XV)

Head luteous with somewhat variable short longitudinal fuscous lines ; antennae luteous, apical joint brownish-ochraceous ; pronotum pale brownish, coarsely darkly punctate, its lateral margins angulately prolonged interiorly, a large subquadrate spot at anterior margin and some transverse broken waved markings across central disc, pale levigate luteous ; scutellum luteous with scattered patches of fuscous punctures, principally at base and lateral areas, those on disk being few and detached ; corium obscure luteous, sparingly darkly punctate ; membrane hyaline ; connexivium luteous with fuscous spots ; body beneath and legs pale luteous ; lateral margins of prosternum, a central spot to each sternal segment, some spots at lateral margins of mesosternum, a double series of spots on lateral abdominal areas and a central spot to apical abdominal segment, pale castaneous. Pronotum with the lateral spines strongly acutely laterally produced ; lateral spines to the apical abdominal segment strongly produced.

Length, 6 mm. ; exp. pronot. angl., 6 mm.

Jalor, Biserat. 17th October, 1901.

'On same shrub as *Seponia variolosa*.'

Antestiaria**29. *Antestia anchora***

Cimex anchora, *Tbunb. Nov. Ins. Sp.* ii, p. 47, t. 2, fig. 60 (1783).

Pentatoma anchora, *Dall. List Hem.* i, p. 254 (1851).

Antestia anchora, *Stål. En. Hem.* v, p. 96 (1876) ; *Dist. Faun. Brit. Ind. Rhynch* i, p. 183, fig. 110 (1902).

Pentatoma cruciata, *Ellenr. Nat. Tijdschr. Nederl. Ind.* xxiv, p. 154 (1862).

Strachia pardalis and *platyspila*, *Walk. Cat. Het.* ii, pp. 330, 337 (1867).

Antestia ellenriederi, *Bredd. Stett. Ent. Zeit.*, 1900, p. 322.

Mabek, Jalor. 26th July, 1901.

'On wing in thick jungle.'

Found throughout Northern India, Burma, Tenasserim, and the Malay Peninsula ; also recorded from Java and Sumatra.

30. *Plautia fimbriata*

Cimex fimbriata, *Fabr. Mant. Ins.* ii, p. 295 (1787).

Pentatoma fimbriata, *Dall. List. Hem.* i, p. 251 (1851).

- Plautia fimbriata*, *Stål. Hem. Afr.* i, p. 191 (1864); *Dist. Faun. Brit. Ind. Rhynch.* i, p. 181, fig. 108 (1902).
Pentatoma fimbriolatum, *Herr-Schäff. Wanz. Ins.* vii, p. 102, fig. 768 (1844).
Pentatoma crossota, *Dall. List. Hem.* i, p. 252 (1851).
Rhaphigaster rufoviridis, *Walk. Cat. Het.* ii, p. 364 (1867).

Jalor, Biserat.

Common throughout the Oriental region, and found in Madagascar.
 'From bushes on waste ground.'

Eurydemaria

31. *Agonoscelis nubila*

- Cimex nubila*, *Fabr. Syst. Ent.*, p. 712 (1775).
Halys nubila, *Fabr. Syst. Rhyng.*, p. 183 (1803).
Aelia (?) *nubila*, *Habn. Wanz. Ins.* iii, p. 29, t. lxxxii, fig. 251 (1835).
Agonoscelis nubila, *Dall. List. Hem.* i, p. 179 (1851); *Dist. Faun. Brit. Ind. Rhynch.* i, p. 189 (1902).
Pentatoma grata, *Palis. de Beauv. Ins.*, p. 129; *Hém.* t. ix, fig. 5 (1805).
Agonoscelis indica, *Spin. Ess.*, p. 329 (1837).
Aelia crucifera, *Westw. in Hope Cat.* i, p. 32 (1837).
Nevrosia sulciventris, *Ellenr. Nat. Tijdschr. Nederl. Ind.* xxiv, p. 144, pl. ii, fig. 11 (1862).

Jalor; Mabek, Biserat. 11th June, 1901.

'On low vegetation on waste ground.'

Throughout British India, Malay Peninsula, several islands of the Malayan Archipelago, and recorded from China and Japan.

32. *Cinxia limbata*

- Cimex limbatus*, *Fabr. Syst. Rhyng.*, p. 176 (1803).
Strachia limbata, *Amy. and Serv. Hém.*, p. 127 (1843).
Cinxia limbata, *Stål. Hem. Fabr.* i, p. 30 (1868); *Dist. Faun. Brit. Ind. Rhynch.* i, p. 195, fig. 117 (1902).

Nawngchik, Bukit Besar.

Common throughout the northern regions of India, and found in Burma, Tenasserim, and the Malay Peninsula. Recorded from Java and Sumatra.

Bukit Besar, Nawngchik. 2,500 feet. 29th April and 3rd May, 1901.

33. Stenozygum speciosum

Strachia speciosa, *Dall. List Hem.* i, p. 261 (1851).

Stenozygum speciosum, *Stål. En. Hem.* v, p. 86 (1879); *Dist. Faun. Brit. Ind. Rhynch.* i, p. 193, fig. 115 (1902).

Strachia inornata, *Walk. Cat. Het.* ii, p. 331 (1867).

Biserat

Somewhat common throughout British India.

Nezaria**34. Catacanthus incarnatus**

Cimex incarnatus, *Dru. Ill.* ii, p. 67, pl. xxxvi, fig. 5 (1773).

Catacanthus incarnatus, *Dall. List Hem.* i, p. 270 (1851); *Dist. Faun. Brit. Ind. Rhynch.* i, p. 218, fig. 138 (1902).

Cimex nigripes, *Fabr. Syst. Ent.*, p. 710 (1775).

Edessa nigripes, *Fabr. Syst. Rbyng.*, p. 149 (1803).

Cimex melanopus, *Gmel. Syst. Nat.* i (4), p. 2149 (1788).

Cimex aurantius, *Sulz. Gesch. Ins.*, p. 96, t. x, fig. 10 (1776).

Pentatoma aurantiacum, *Blanch. Dist. des Ins.* iii, p. 29; *Hem.* t. vi, fig. 4 (1840-41).

Jalor; Mabek, Biserat.

Found throughout British India, extensively distributed in the Malayan Archipelago, and reported from Japan and Korea.

35. Nezara viridula

Cimex viridulus, *Linn. Syst. Nat. ed.* x, p. 444 (1758).

Nezara viridula, *Stål. Hem. Afr.* i, p. 193 (1864); *Dist. Faun. Brit. Ind. Rhynch.* i, p. 220, fig. 139 (1902).

Cimex smaragdula, *Fabr. Syst. Ent.*, p. 711 (1775).

Cimex torquatus, *Fabr. Syst. Ent.*, p. 710 (1775).

Pentatoma flavicollis and *flavicornis*, *Palis. de Beauv. Ins. Hem.*, p. 185, t. xi, fig. 4 (1805).

Pentatoma unicolor, *oblonga*, *subsericea*, *leii*, *tripunctigera*, *proxima*, *chinensis*, *berylina*, *West. in Hope Cat.* i, pp. 37, 38 (1837).

Pentatoma plicaticollis, *Lucas, Explr. Alger. Ins.*, p. 87; *Hém.*, t. 111, fig. 9 (1849).

Pentatoma vicaria, *Walk. Cat. Het.* ii, p. 303 (1867).

For further synonymy, *cf. Dist. Biol. Centr. Amer. Rhynch.* i, p. 78 (1880).

Ban Sai Kau, Nawngchik. 20th May, 1901.

Biserat, Jalor. 30th June, 1901.

Biserat, Jalor. 12th July, 1901.

Almost universally distributed.

'This species was commonly found on the leaves and inflorescence of a tall, yellow, leguminous herb, and dropped to the ground very readily when disturbed.'

Menidaria

36. *Paterculus conspersus*, sp. nov.

(Pl. XV)

Ochraceous, thickly covered with coarse piceous punctures; antennae, extreme lateral margins of head, pronotum, basal area of corium and connexivium, central lobe of head, a spot at inner margin of each eye, two discal spots on anterior area of pronotum, three small spots at basal margin and a linear spot on each side of apex of scutellum, body beneath rostrum and legs, luteous or pale ochraceous; fourth and fifth joints of antennae excluding bases, eyes, a subobsolete central transverse fascia to pronotum, inner area of connexivum, irregular punctures to sternum, a broad irregular sublateral abdominal fascia, disks of sixth and anal abdominal segments, and small spots to legs, fuscous or brown; second and third joints of antennae almost subequal in length, fourth and fifth longest and also subequal; lateral margins of head convex and distinctly reflexed, membrane bronzy, shining.

Length, 9 mm.; exp. pronot. angl., $5\frac{1}{2}$ mm.

Biserat, Jalor.

Euryaspisaria

37. *Brachycoris insignis*

Brachycoris insignis, *Dist. Ann. Mag. Nat. Hist.* (7) v, p. 420 (1900); *id. Faun. Brit. Ind. Rhynch.* i, p. 241, fig. 154 (1902).

Biserat, Jalor. 20th October, 1901.

'On shrub with Nos. 23 and 28, *antea*.'

Also received from Ceylon, Burmah, and Borneo.

TESSARATOMINAE

Tessaratomaria

38. *Tessaratomia javanica*

Cimex javanicus, *Thunb. Nov. Ins. Sp.* ii, p. 45 (1783).

Tessaratomia javanica, *Amy. and Serv. Hém.*, p. 165 (1843); *Voll. Faun. Ind. Néerl.* iii, p. 25, pl. 3, f. 4b (1868); *Stål. En. Hem.* i, p. 67 (1870); *Dist. Faun. Brit. Ind. Rhynch.* i, p. 259 (1902).

Tessaratoma proxima, *Westw. in Hope, Cat. i*, p. 27 (1837).

Tessaratoma papillosa, *Blanch. Hist. Ins. Hém.* p. 142, pl. vi, f. 2 (1840).

Tessaratoma angularis, *Dohrn, Stett. Ent. Zeit.* xxiv, p. 349 (1863).

Tessaratoma striata, *furcifera*, *timorensis*, and *clara*, *Walk. Cat. Het.* iii, pp. 463, 464 (1868).

Tessaratoma papillosum, *var. clara*, *Kirby, Journ. Linn. Soc. London, Zool.* xxiv, p. 87 (1891).

Tessaratoma papillosa, *part. Dist. Ann. Mag. Nat. Hist.* (7) vi, p. 60 (1900); *Stoll, Pun.*, fig. 2.

Biserat, Jalor. July, 1901.

‘From long grass in jungle.’

Distributed throughout British India and the Malay Peninsula, and also found in many islands of the Malay Archipelago.

39. *Pygoplatys minax*

Pygoplatys minax, *Voll. Faun. Ind. Néerl.* iii, p. 23, pl. iii, f. 3 (1868).

Bukit Besar, Nawngchik. 3,500 feet. 27th August, 1901.

‘Flying about in considerable numbers in stunted jungle at the top of the hill.’

Recorded also from Johore and Borneo.

40. *Pygoplatys firmatus*

Piezosternum firmatum, *Walk. Cat. Het.* iii, p. 458 (1868).

Pygoplatys firmatus, *Dist. Ann. Mag. Nat. Hist.* (6) xi, p. 432 (1893).

Bukit Besar, Nawngchik. 2,500 feet. 10th May, 1901.

Eusthenaria

41. *Eusthenes eurytus*

Eusthenes eurytus, *Dist. Trans. Ent. Soc.*, 1887, p. 358; *id. Faun. Brit. Ind. Rhynch.* i, p. 265 (1902).

Bukit Besar, Nawngchik. 3,500 feet. 27th August, 1901.

‘Flying about in considerable numbers in stunted jungle at the top of the hill.’

Also found in Assam.

42. *Eusthenes saevus*

Eusthenes saevus, *Stål. Trans. Ent. Soc.* (3) i, p. 597 (1863); *Dist. Faun. Brit. Ind. Rhynch.* i, p. 265 (1902).

Telôm, Perak-Pahang boundary. 4,000 feet. January, 1902.

Also found in India and China.

43. Pycanum rubens

Cimex rubens, *Fabr. Ent. Syst.* iv, p. 107 (1794).

Pycanum rubens, *Stål. Hem. Fabr.* i, p. 40 (1868); *Dist. Faun Brit. Ina. Rbynch.* i, p. 274, fig. 174 (1902).

Cimex amethystinus, *Weber, Obs. Ent.*, p. 115 (1801).

Aspongopus amethystinus, *Burm. Handb.* ii, p. 351 (1835).

Edessa amethystina, *Fabr. Syst. Rhyng.*, p. 150 (1803).

Tessaratomya alternata, *Lepell. and Serv. Encyc. Méth.* x, p. 591 (1825).

Biserat, Jalor. June, July, October, 1901.

'On low vegetation in open ground.'

A common British Indian and Malayan species.

44. Pycanum pretiosum

Pycanum pretiosum, *Stål. Öfv.-Vet. Ak. Förh.*, 1854, p. 234; *op. cit.* 1856, p. 64, pl. 1a, fig. 2; *Dist. Ann. Mag. Nat. Hist.* (6) xi, p. 434 (1893).

Pycanum rubidum, *Walk. Cat. Het.* iii, p. 471 (1868).

Bukit Besar, Nawngchik. 2,500 feet. 2nd September, 1901.

'On leaves in jungle; late afternoon, after rain.'

Also recorded from the Philippines.

DINIDORINAE**45. Aspongopus chinensis**

Aspongopus chinensis, *Dall. List. Hem.* i, p. 349 (1851); *Dist. Faun. Brit. Ind. Rbynch.* i, p. 285 (1902).

Ban Sai Kau, Nawngchik. May, 1901.

Biserat, Jalor. June, 1901.

'A common road-side insect.'

Also found in Assam and Sikkim; originally described from China.

46. Megymenum parallelum

Megymenum parallelum, *Voll. Faun. Ind. Néerl.* iii, p. 48, pl. iv, fig. 10 (1868); *Stål. En. Hem.* i, p. 232 (1870); *Dist. Faun. Brit. Ind. Rbynch.* i, p. 286, fig. 180 (1902).

Bukit Besar, Nawngchik. 2,500 feet. 13th July, 1901.

Biserat, Jalor. October.

'From low vegetation on jungle floor.'

Also recorded from Assam, Andaman Islands, Java, and Sumatra.

ACANTHOSOMATINAE**47. Microdeuterus aequalis**

Microdeuterus aequalis, *Walk. Cat. Het.* ii, p. 390 (1867).

Bukit Besar, Nawngchik. 2,500 feet.

Originally described from Borneo.

COREIDAE**COREINAE****Mictaria****48. Derepteryx feana**

Derepteryx feana, *Dist. Faun. Brit. Ind. Rbynch.* i, p. 335 (1902).

Bukit Besar, Nawngchik. 2,500 feet. May, 1901.

Originally described from Tenasserim.

49. Prionolomia malaya

Prionolomia malaya, *Stål. Ann. Soc. Ent. Fr.*, 1865, p. 172.

Bukit Besar, Nawngchik. 2,500 feet. 2nd September, 1901.

Also found in Sumatra and Borneo.

50. Mictis lateralis

Mictis lateralis, *Waik. Cat. Het.* iv, p. 29 (1871).

Biserat, Jalor.

Originally described from Borneo.

51. Mictis longicornis

Mictis longicornis, *Westw. in Hope Cat.* ii, p. 11 (1842); *Stål. En. Hem.* iii, p. 45 (1873).

Cerbus fulvicornis, *Habn. Wanz. Ins.* i, p. 7, fig. 1 (1831).

Cerbus tenebrosus, *Burm. Handb.* 2, i, p. 340, 5 (1835); *Herr.-Schäff. Wanz. Ins.* vi, p. 22, fig. 578, and taf. cxc, fig. c (1842).

Mictis fulvicornis, *Dall. List. Hem.* ii, p. 403 (1852).

Mictis conjunctus, *Herr.-Schäff. Wanz. Ins.* ix, p. 247 (1853); *Stoll. Pun.* fig. 188.

Biserat, Jalor. July, October, 1901.

‘Very common among low herbage in secondary jungle; occasionally captured at light.’

Found also in Java and the Philippines.

52. Mictis tenebrosa

Cimex tenebrosus, *Fabr. Mant.* ii, p. 288 (1787).

Mictis tenebrosus, *Dist. P.Z.S.*, 1901 (i) p. 327 ; *id Faun. Brit. Ind. Rbynch.* i, p. 344, fig. 209 (1902).

Cerbus umbilicatus, *Herr.-Schäff. Wanz. Ins.* vi, p. 29, pl. 190, fig. A (1842).

Myctis fasciatus, *Westw. in Hope Cat.* ii, p. 11 (1842).

Mictis nigricornis, *Dall. List. Hem.* ii, p. 400 (1852).

Stoll. Pun. fig. 277.

Biserat, Jalor. 3rd July, 1901.

Gedong, South Perak. January, 1902.

‘Amongst Indian corn, and elsewhere in open country.’

Distributed through British India, the Malay Peninsula, and China.

53. Mictis acutangula

Mictis acutangula, *Stål. Ann. Soc. Ent. Fr.*, 1865, p. 173.

Telôm, Perak-Pahang boundary. 4,000 feet. January, 1902.

Found in Borneo and Malacca.

54. Anoplocnemis phasiana

Lygaeus phasianus, *Fabr. Spec. Ins.* ii, p. 361 (1781).

Anoplocnemis phasiana, *Dist. id. Ann. Mag. Nat. Hist.* (7) vi, p. 373 (1900) ;
id. P.Z.S., 1901 (i), p. 327 ; *Faun. Brit. Ind. Rbynch.* i, p. 346, fig. 210 (1902).

Lygaeus grossipes, *Fabr. Syst. Rbyng.*, p. 205, 11 (1803).

Cerbus tumidipes, *Herr.-Schäff. Wanz. Ins.* vi, p. 54, fig. 614 (1842).

Mictis punctum, *affinis, bicolor*, *Westw. in Hope Cat.* ii, p. 10 (1842).

Mictis dubia castanea, lata, *Dall. List. Hem.* ii, pp. 389, 390 (1852).

Myctis ferrifera, *Walk. Cat. Het.* iv, p. 24, 57 (1871).

Stoll. Pun., figs. 68, 69.

Biserat, Jalor. October.

Bidor, South Perak. February, 1902.

Gedong, South Perak. January, 1902

Distributed throughout British India and the Malay Peninsula ; also found in many islands of the Malayan Archipelago.

Daladeraria**55. Dalader acuticosta**

Dalader acuticosta, *Amy. and Serv. Hem.*, p. 188, pl. iv, fig. 7 (1843); *Dist. Faun. Brit. Ind. Rhynch.* i, p. 352, fig. 212 (1902).
Stoll. Pun., fig. 183.

Biserat, Jalor.

Distributed throughout British India.

56. Dalader planiventris

Acanonicus planiventris, *Westw. in Hope Cat.* ii, p. 8 (1842).
Dalader planiventris, *Dist. Faun. Brit. Ind. Rhynch.* i, p. 352 (1902).
Dalader rotundicosta, *Amy. and Serv. Hem.* p. 188 (1843).

Biserat, Jalor. 11th July, 1901.

‘Among low vegetation on waste ground.’

Found throughout British India and also in the Malay Peninsula and Sumatra.

Homoeoceraria**57. Homoeocerus limbatipennis**

Tliponius limbatipennis, *Stål. Öfv. Vet.-Ak. Förh.*, 1859, p. 464.
Homoeocerus limbatipennis, *Stål. En. Hem.* iii, p. 60 (1873); *Dist. Faun. Brit. Ind. Rhynch.* i, p. 362 (1902).

Telôm, Perak-Pahang boundary. 4,000 feet. January, 1902.

Found in Burma and Tenasserim and in several islands of the Malayan Archipelago.

58. Homoeocerus graminis

Lygaeus graminis, *Fabr. Syst. Rhyng.* p. 216, 55 (1803).
Homoeocerus graminis, *Stål. Hem. Fabr.* i, p. 59 (1868); *Dist. Faun. Brit. Ind. Rhynch.* i, p. 363 (1902).
Homoeocerus turbidus, *Walk. Cat. Het.* iv, p. 95 (1871).

Biserat, Jalor. 29th June, 1901. (At light).

Not uncommon in British India.

59. Homoeocerus abdominalis

Homoeocerus abdominalis, *Dist. Ann. Mag. Nat. Hist.* (7) vii, p. 11 (1901).

Biserat, Jalor. 20th October, 1901.

‘One specimen on wing in open, late afternoon; others on flowering shrub.’

Originally described from the Malay Peninsula.

60. Homoeocerus albiguttulus

Homoeocerus albiguttulus, *Stål. En. Hem.* iii, p. 61 (1873); *Dist. Faun. Brit. Ind. Rhynch.* i, p. 361 (1902).

Bukit Besar, Nawngchik. 2,500 feet. May, August, 1901.

‘Among low vegetation in jungle.’

Common in the northern Indian districts and throughout Burma; it was originally described from Cochin China, and is recorded from Sumatra.

Cloresmaria**61. Notobitus sexguttatus**

Nematopus sexguttatus, *Westw. in Hope Cat.* ii, p. 13 (1842).

Nematopus longipes, *Dall. List. Hem.* ii, p. 423 (1852).

Nematopus malayus, *Stål. Öfv. Vet.-Ak. Förb.*, 1854, p. 234.

Notobitus sexguttatus, *Dist. P.Z.S.*, 1901, p. 330.

Batang Padang, South Perak.

Found throughout the Malay Peninsula and China.

62. Notobitus meleagris

Cimex meleagris, *Fabr. Mant.* ii, p. 297, 179 (1787).

Lygaeus meleagris, *Wolff, Icon.* i, p. 23, fig. 23 (1800).

Nematopus meleagris, *Burm. Handb.* ii, p. 337 (1835); *Herr.-Schäff. Wanz.*

Ins. vi, p. 79, fig. 650 (1842); *Amy. and Serv. Hém.*, p. 200 (1843).

Notobitus meleagris, *Dist. Faun. Brit. Ind. Rhynch.* i, p. 371 (1902).

Stoll. Pun. figs. 213, 278.

Biserat, Jalor. July, 1901.

Also recorded from Southern India, China, and several islands of the Malayan Archipelago.

Colpuraria**63. Wolfius exemplificatus**

Wolfius exemplificatus, *Dist. Faun. Brit. Ind. Rhynch.* i, p. 380, fig. 221 (1902).

Bukit Besar, Nawngchik. 2,500 feet. 3rd May, 1901.

‘Clearing, early morning.’

Originally received from Tenasserim.

64. Colpura labecula

Colpura labecula, *Dist. Ann. Mag. Nat. Hist.* (7) vii, p. 17 (1901).

Telôm, Perak-Pahang boundary. 4,000 feet. 18th January, 1901.

Originally described from the Malay Peninsula.

Anisoscelaria**65. Leptoglossus membranaceus**

Cimex membranaceus, *Fabr. Spec. Ins.* ii, p. 351 (1781).

Lygaeus membranaceus, *Fabr. Ent. Syst.* iv, p. 139 (1794).

Anisoscelis membranaceus, *Burm. Handb.* ii, p. 332 (1835).

Theognis membranaceus, *Stål. Hem. Afr.* ii, p. 86 (1865).

Cimex mormodicæ, *Forst. Descr. An.*, p. 16 (1844).

Anisoscelis orientalis, *Dall. List. Hem.* ii, p. 454 (1852).

Anisoscelis flavopunctatus, *Sign. in Maillard, Notes sur l'île de la Réunion. Annexe J.* i, p. 27, pl. xxi, fig. 4 (1863).

Leptoglossus membranaceus, *Dist. Faun Brit. Ind. Rbynch.* i, p. 382, fig. 224 (1902).

Biserat, Jalor. July and October, 1901.

Widely distributed throughout British India, the Malayan Archipelago, Australasia, Tropical and Southern Africa.

Physomeraria**66. Physomerus grossipes**

Lygaeus grossipes, *Fabr. Ent. Syst.* iv, p. 135 (1794).

Physomerus grossipes, *Burm. Handb.* ii, p. 341 (1835); *Stål. Hem. Fabr.* i, p. 45 (1868); *Dist. Faun. Brit. Ind. Rbynch.* i, p. 383, fig. 225 (1902).

Lygaeus calcar, *Fabr. Syst. Rbyng.* p. 214 (1803).

Physomerus calcar, *Herr.-Schäff. Wanz. Ins.* vi, p. 60, fig. 621 (1842).

Coreus (Cerbus) oedymerus, *Burm. Nov. Ac. Acad. Leop.* xvi, Suppl. p. 296 (1834).

Physomerus delineatus, *Walk. Cat. Het.* iv, p. 59 (1871).

Biserat, Jalor. July, 1901.

Sungkei, South Perak. 9th February, 1902.

Widely distributed throughout India and the Malayan Archipelago.

67. Acanthocoris scaber

Cimex scaber, *Linn. Cent. Ins. rar.*, p. 17 (1763).

Alydus scaber, *Thunb. Hem. rostr. Cap.* iii, p. 2 (1822).

Acanthocoris acutus, *Dall. List. Hem.* ii, p. 516 (1852).

Acanthocoris scaber, *Stål. Berl. Ent. Zeit.* x, p. 158 (1866).

Bukit Besar, Nawngchik. 2,500 feet. 3rd May, 1901.

Sungkei, South Perak. February, 1902.

Gedong, South Perak. January, 1902.

‘On Bukit Besar this species was very numerous, chiefly frequenting the stems and leaves of a prickly solenaceous plant, and was found in all stages of development under the same leaf.’

Also received from China and several islands of the Malayan Archipelago.

Pendulinaria**68. Pendulinus laminatus**

Pendulinus laminatus, *Stål. En. Hem.* iii, p. 74 (1873).

Kampong Jalor, Jalor. October, 1901.

Described from Java ; common at Penang.

Gonoceraria**69. Cletus punctulatus**

Coreus punctulatus, *Westw. in Hope Cat.* ii, p. 23 (1842).

Cletus femoralis, *Kirby, Journ. Linn. Soc. Zool.* xxiv, p. 94 (1891).

Cletus punctulatus, *Dist. Faun. Brit. Ind. Rhynch.* i, p. 392, fig. 231 (1902).

Bidor, South Perak. February, 1902.

70. Cletomorpha walkeri

Cletomorpha walkeri, *Kirby, Journ. Linn. Soc. Zool.* xxiv, p. 96 (1891); *Dist. Faun. Brit. Ind. Rhynch.* i, p. 397 (1902).

Cletomorpha benita, *Kirby, Journ. Linn. Soc. Zool.* xxiv, p. 97 (1891).

Bukit Besar, Nawngchik. 2,500 feet. 8th May, 1891.

Described from Ceylon.

Leptocorisaria**71. Leptocorisia costalis**

Myodochus costalis, *Herr.-Schäff. Wanz. Ins.* viii, p. 96, fig. 864 (1848).

Leptocorisia biguttata, *Walk. Cat. Het.* iv, p. 174 (1871); *Bredd. Abb. Nat. Ges. Halle.* xxiv, p. 73 (1901).

Leptocorisa varicornis, var. *biguttata*, *Bredd. Abh. Senckenb. Ges.* xxv, p. 158.
Leptocorisa costalis, *Dist. Faun. Brit. Ind. Rhynch.* i, p. 411 (1902).

Biserat, Jalor. 30th June, 1901.

‘On leaves of tall yellow-flowered pea.’

Telôm, Perak-Pahang boundary. 4,000 feet. 18th January, 1902.
 Gedong, South Perak. January, 1902.
 Semangko Pass, Selangor-Pahang border. 2,700 feet. 23rd May, 1902.

‘Very common, flying among long grass in old Sakai clearings.’

Found in Burma and Tenasserim, and also recorded from Java, Borneo, Celebes, and Gilolo.

72. *Curupira bicolor*

Curupira bicolor, *Dist. Ann. Mag. Nat. Hist.* (7) vii, p. 426 (1901); *id. Faun. Brit. Ind. Rhynch.* i, p. 412, fig. 242 (1902).

Bukit Besar, Nawngchik. 2,500 feet. 25th August, 1901.

‘Running on banana leaf in early morning, in company with a number of larvae, which resembled ants (*Oecophylla*) both in shape and movements.’ N.A.

Not uncommon in Burma, and found in several islands of the Malayan Archipelago.

73. *Acestra malayana*, sp. nov.

(Pl. XV)

Ochraceous, with an olivaceous tint; eyes black, between eyes including the ocelli, a posteriorly curved fascia of black punctures; two small linear black lines on disk of anterior pronotal area; head and pronotum thickly punctate; coreum linearly punctate, membrane pale fuliginous hyaline; femora finely speckled with olivaceous; tibiae, tarsi, rostrum, and antennae, excluding basal joint, olivaceous. Length, $18\frac{1}{2}$ mm.

Differs from *A. sinica*, Dall., by the more slender and non-pilose antennae, black marking to head and pronotum, etc.

Mabek, Jalor. 23rd July, 1901.

Alydaria

Porta, gen. nov.

Body elongate, slender; head triangularly produced in front; antennae about as long as the body, basal joint longer than the head, its apex a little clavate, second and fourth joints subequal, third joint a little shorter; rostrum

passing the anterior coxae, first joint stout about reaching eyes, slightly shorter than second joint; legs long and slender, tibiae slightly longer than femora and longly hirsute; pronotum scarcely longer than head, with a distinct anterior collar and transversely constricted before middle, the anterior area subglobose, posterior angles armed with a long erect spine, slightly curved at apex; head with a central sulcation, the eyes placed at some distance from the anterior margin of the pronotum; abdomen slender, widened and thickened posteriorly, its lateral margins sinuate.

74. *Porta gracilis* sp. nov.

(Pl. XV)

Black, shining; head and abdomen beneath opaque; antennae, rostrum, and legs, dull castaneous; tibiae, tarsi, and basal joint of antennae—excluding apex, ochraceous; bases of femora, and spots to corium—of which the largest is near apical angle, pale stramineous; apex of first joint of antennae and extreme apices of tibiae, fuscous; pronotum and corium strongly punctate, tibiae longly hirsute. Length, $7\frac{1}{2}$ to 8 mm.

Bukit Besar, Nawngchik. 2,500 feet. 9th and 17th May, 1901.

‘In damp situations in jungle; very common on low vegetation.’

CORIZINAE

Corizaria

75. *Corizus robinsoni*, sp. nov.

(Plate XV)

Head ochraceous, or ochraceous with the base black, or wholly black; pronotum ochraceous, the anterior area narrowly, and the posterior area broadly black; scutellum black, a small linear spot at each basal angle, and the apex broadly ochraceous; corium pale greenish hyaline, its apical area broadly black, connexivium black, with large ochraceous spots; body beneath variable in coloration, sometimes ochraceous, the sternum darkly punctate, the abdomen with two central fuscous fasciae united posteriorly, or the abdomen piceous with the fasciae ochraceous; stigmal and marginal spots ochraceous; antennae piceous, apical joint fuscous, first joint short, incrassated, second, third, and fourth joints subequal in length; legs luteous, speckled with black, sometimes almost totally black; membrane pale hyaline, Length, 6 mm.

Biserat, Jalor. 29th June, 1901.

‘Flying about among low bushes on waste ground; flight very rapid, easy, and fly-like.’

Serinetharia**76. Serinetha abdominalis**

Lygaeus abdominalis, *Fabr. Syst. Rbyng.*, p. 226 (1803).

Leptocoris abdominalis, *Burm. Handb.* ii, p. 305 (1835).

Lygaeomorphus abdominalis, *Blanch. Hist. des Ins.* iii, p. 116 (1840).

Pyrrhotes abdominalis, *Westw. in Hope Cat.* ii, p. 26 (1842).

Serinetha abdominalis, *Stål. Hem. Fabr.* i, p. 68 (1868); *Dist. Faun. Brit. Ind. Rbynch.* i, p. 419, fig. 246 (1902).

Lygaeus augur (part), *Fabr. Ent. Syst.* iv, p. 161 (1794).

Leptocoris rufus, *Habn. Wanz. Ins.* i, p. 201, fig. 102 (1831).

Serinetha taprobanensis, *Dall. List. Hem.* ii, p. 461 (1852).

Leptocoris bahram, *Kirk, Bull. Liverp. Muss.* ii, p. 46 (1899).

'Our collections afford numerous instances of the convergent groups noted in Sarawak by Mr. SHELFORD.' The present species belongs to that author's group I (Lycoid pattern). Our own examples include, besides the longicorn *Eurycephalus lundi*, several Malacoderms and a Hispid, not yet identified, and Hemiptera of three families, viz., *Serinetha abdominalis* (Coreidae), *Antilochus coqueberti* and *Dindymus rubiginosus* (Pyrrhocoridae), *Vilius macrops* (Reduviidae). The large Malacoderms of this group were extremely common at Telôm, where both *S. abdominalis* and *Ectatops rubiaceus* were taken.'

Telôm, Perak-Pahang boundary. 4,000 feet. January, 1902.

LYGAEIDAE**LYGAEINAE****77. Tropidothorax fimbriatus**

Lygaeus fimbriatus, *Dall. List. Hem.* ii, p. 546 (1852).

Melanospilus fimbriatus, *Stål. En. Hem.* iv, p. 104 (1874).

Patani.

Recorded from Ceylon, Java, and the Philippine Islands.

78. Graptostethus diffusus

Lygaeus diffusus, *Walk. Cat. Het.* v, p. 59 (1872).

Graptostethus diffusus, *Dist. Ann. Mag. Nat. Hist.* (7) vii, p. 537 (1901).

Biserat, Jalor. 30th June, 1901.

'Feeding on the seed-vessels of a tall, yellow flowered leguminous plant growing on open waste ground.'

BLISSINAE

79. *Spalacocoris sulcatus*

Ischnodemus sulcatus, *Walk. Cat. Het.* v, p. 133 (1872).

Spalacocoris sulcifer, *Stål. En. Hem.* iv, p. 130 (1874).

Spalacocoris sulcatus, *Dist. Ann. Mag. Nat. Hist.* (7) viii, p. 466 (1901).

Bukit Besar, Nawngchik. 2,500 feet. 6th May, 1901.

‘Found sucking the young shoot of zingiberaceous plant; emitted a very powerful and disagreeable odour.’

A well-known Malaccan species.

GECORINAE

80. *Geocoris splendidus*

Geocoris splendidus, *Dist. Faun. Brit. Ind. Rhynch.* ii, p. 30 (1903)

Biserat, Jalor

Originally described from Burma.

COLOBATHRISTINAE

81. *Artemidorus noctis*, sp. nov.

(Pl. XV)

Black, shining, coarsely punctate; hemelytra piceous brown; extreme apex of scutellum, two large spots to connexivium—one near base the other near apex; acetabula, trochanters, bases of posterior femora, under surface of anterior femora; apex of second joint of rostrum and antenniferous tubercles luteous; body and antennae pilose; lateral margins of pronotum and the legs longly pilose; anterior and intermediate femora with a short spine beneath, near apices; posterior lobe of pronotum and the scutellum with a distinct central carination; first and fourth joints of antennae shortest and subequal; second longest, longer than third. Length, 9 mm.

Bukit Besar, Nawngchik. 2,500 feet.

82. *Malcus flavidipes*

Malcus flavidipes, *Stål. Freg. Eug. Resa. Ins.*, p. 242, pl. iii, fig. 2 (1856).

Bukit Besar, Nawngchik. 2,500 feet. 28th August, 1901.

‘On plant growing in stream.’

Found also in British India and Java.

PACHYGRONTINAE**83. Pachygrontha brevicornis.**

Pachygrontha brevicornis, *Stål. Öfv. Vet.-Ak. Förh.*, 1870, p. 662.

Gedong, South Perak. January, 1902.

Also found in the Phillipines.

APHANINAE**84. Clerada apicicornis**

Clerada apicicornis, *Sign. in Maillard, Notes sur l'île Réun. Ins.*, p. 28; *Stål. Hem. Afr.* ii, p. 155 (1865); *Dist. Ann. Mag. Nat. Hist.* (7) viii, p. 476 (1901).

Gastrodes terminalis, *Walk. Cat. Het.* v, p. 122 (1872).

Very widely distributed. Already recorded from the Neotropical, Ethiopian, Oriental, and Australasian regions.

85. Pamera pallicornis

Rhyparochromus pallicornis, *Dall. List. Hem.* ii, p. 573 (1852).

Plociomerus discoguttata, *Dobrn. Stett. Ent. Zeit.* xxi, p. 404 (1860).

Rhyparochromus delineatus, *Walk. Cat. Het.* v, p. 103 (1872).

Pamera pallicornis, *Dist. Ann. Mag. Nat. Hist.* (7) viii, p. 479 (1901).

Bukit Besar, Nawngchik. 1,500 feet. 19th May, 1901.

Biserat Jalor. 1st July, August, 1901. (At light).

Bidor, South Perak. February, 1902. (At light).

Kuala Lumpur, Selangor. April, 1902. (At light).

‘On Bukit Besar, among long grass.’

Found in Ceylon, many islands of the Malayan Archipelago, and in Japan.

86. Pamera nietneri

Plociomerus nietneri, *Dobrn. Stett. Ent. Zeit.* xxi, p. 404 (1860).

Pamera nietneri, *Stål En. Hem.* iv, p. 151 (1874).

Patani Town.

Found also in Ceylon, Java, Phillipines, and Cochin China.

87. Eucosmetus incisus

Rhyparochromus incisus, *Walk. Cat. Het.* v, p. 100 (1872).

Plociomerus incisus, *Kirby, Journ. Linn. Soc. Zool.* xxiv, p. 101 (1891).

Eucosmetus incisus, *Dist. Ann. Mag. Nat. Hist.* (7) viii, p. 483 (1901).

Bukit Besar, Nawngchik. 2,500 feet. 8th May, 1901.

‘Flying in clearing.’

Telôm, Perak-Pahang boundary. 4,000 feet. January, 1902.

‘Feeds on seeds of a species of sedge; very ant-like in gait and appearance.’

Found also in Ceylon.

88. *Critobulus insignis*

Critobulus insignis, *Dist. Faun. Brit. Ind. Rhynch.* ii, p. 77 (1903).

Bukit Besar, Nawngchik. 2,500 feet.

Originally described from Assam.

89. *Narbo fasciatus*

Narbo fasciatus, *Dist. Ann. Mag. Nat. Hist.* (7) viii, p. 505 (1901).

Gedong, South Perak. January, 1902.

Described from South-East Borneo.

90. *Narbo longipes*

Narbo longipes, *Stål. Berl. Ent. Zeit.* x, p. 161 (1866).

Originally described from Borneo.

91. *Poecantius lineatus*

Poecantius lineatus, *Stål. En. Hem.* iv, p. 162 (1874).

Kampong Jalor, Jalor. October, 1901.

Recorded from the Philippines and Japan.

PYRRHOCORIDAE

LARGINAE

92. *Physopelta gutta*

Pyrrhocoris gutta, *Burm. Nov. Act. Ac. Leop.* xvi, Suppl. p. 300, pl. xli, fig. 10 (1834); *id. Handb.* ii, p. 285 (1835).

Physopelta gutta, *Stål. Berl. Ent. Zeit.* viii, p. 391 (1863).

Physopelta bimaculata, *Stål, Öfv. Vet.-Ak, Förb.*, 1855, p. 186.

Biserat, Jalor.

July, 20th October, 1901.

Gedong, South Perak.

January, 1902.

Jeram Kawan, South Perak.

February, 1902.

Generally distributed throughout the Oriental region and in many islands of the Malayan Archipelago.

93. Physopelta albofasciata

Cimex albofasciatus, *De Geer. Mem.* iii, p. 335, pl. xxxiv, fig. 1 (1773); *Fabr. Sp. Ins.* ii, p. 354 (1781); *id. Mant.* ii, p. 299 (1787).

Lygaeus albofasciatus, *Fabr. Ent. Syst.* iv, p. 153 (1794); *Syst. Rbyng.*, p. 221 (1803).

Physopelta albofasciata, *Stål. Berl. Ent. Zeit.* vii, p. 390 (1863).

Cimex erythromelas, *Gm. Syst. Nat.* i, iv, p. 2171 (1788).

Cimex erythromela, *Tigny. Hist. des Ins.*, ed. 2, iv, p. 277 (1813).

Physopelta erythrocephala, *Amy. and Serv. Hém.*, p. 271 (1843).

Physopelta affinis, *Amy. and Serv. Hem.*, p. 272 (1843).

Bukit Besar, Nawngchik.

A well-known Javan insect.

94. Antilochus coqueberti

Lygaeus coqueberti, *Fabr. Syst. Rbyng.*, p. 222 (1803).

Pyrrhocoris coqueberti, *Burm. Handb.* ii, i, p. 284 (1835); *Herr.-Schäff. Wanz. Ins.* vi, p. 77, fig. 647 (1842).

Astemma coqueberti, *Blanch. Hist. des Ins.*, p. 120 (1840).

Odontopus coqueberti, *Stål. Öfv. Vet.-Ak. Förh.* (1855) p. 390.

Antilochus coqueberti, *Stål. Hem. Fabr.* i, p. 81 (1868).

Sungkei, South Perak. February, 1902.

Biserat, Jalor. 29th June, 1901.

‘In waste ground.’

Widely distributed in the Oriental region.

95. Ectatops rubiaceus

Ectatops rubiaceus, *Amy. and Serv. Hem.*, p. 273 (1843); *Stål. Berl. Ent. Zeit.* vii, p. 396 (1863); *de Vuillef. Ann. Soc. Ent. Fr.*, p. 144 (1864).

Jeram Kawan, South Perak. 14th February, 1902.

Telôm, Perak-Pahang boundary. 4,000 feet. January, 1902.

‘Not uncommon upon dead trees; larvae under bark.’

Somewhat common in the Malayan Archipelago.

96. Ectatops obscurus

Ectatops obscurus, *de Vuillef. Ann. Soc. Ent. Fr.* 1864, p. 144.

Bukit Besar, Nawngchik.

Originally described from Malacca.

97. Dindymus rubiginosus

Cimex rubiginosus, *Fabr. Mant. Ins.* ii, p. 301 (1787); *Gmel. Syst. Nat.* i, iv, p. 2174 (1788).

Lygaeus rubiginosus, *Fabr. Ent. Syst.* iv, p. 159 (1794); *id. Syst. Rbyng.*, p. 226 (1803).

Pyrrhocoris rubiginosus, *Burm. Handb.* ii, i, p. 284 (1835).

Dindymus rubiginosus, *Stål. Berl. Ent. Zeit.* vii, p. 399 (1863).

Dysdercus hypogastricus, *Herr. Schäff. Wanz. Ins.* ix, p. 177, fig. 979 (1853).

Bukit Besar, Nawngchik. 2,500 feet.

Biserat, Jalor. 20th October, 1901.

'In conspicuous positions on bushes.'

Common in both Java and Sumatra.

98. Dindymus albicornis

Lygaeus albicornis, *Fabr. Syst. Rbyng.*, p. 223 (1803).

Dindymus albicornis, *Stål. Berl. Ent. Zeit.* vii, p. 399 (1863); *id. Hem. Fabr.* i, p. 82 (1868).

Bukit Besar, Nawngchik. 2,500 feet. May, 1901.

'This species is not uncommon in August and September on the trunks of trees in the jungle on Bukit Besar. The very young larvae have something of a resemblance to small specimens of the ant *Oecophylla smaragdina*, while the adults might be mistaken at a casual glance for newly-hatched larvae' of the mantis *Hymenopus bicornis*, though they are not generally found in the same situations.' N.A.

Delacampius, nov.

Allied to *Dindymus*, Stal.; head immersed to eyes, which touch the anterior margin of the pronotum; rostrum reaching the posterior coxae, first joint shorter than head, which is prominently and broadly centrally grooved or sulcated beneath; antennae with the first and fourth joints longest and subequal, or first not longer than fourth; pronotum with the lateral margins strongly sinuate and laminate, very slightly reflexed, transversely impressed near middle; scutellum rather small, triangular; corium a little broadened posteriorly; basal incisures to the second, third and fourth abdominal segments, upwardly recurved; anterior femora moderately incrassated, anterior tibiae with a short apical spine.

1. But Shelford believes that these larvae mimic the larvae of *Eulyesamoena*. I shall have more to say on this point later.—N. A.

99. *Delacampius typicus*, sp. nov.

(Pl. XV)

Dark piceous ; lateral margins of pronotum and corium broadly reddish ochraceous ; membrane with a narrow transverse curved ochraceous line near base ; lateral margins of prosternum and abdomen reddish ochraceous ; rostrum and tarsi brownish ochraceous ; antennae black ; apical joint pale luteous ; its apex black ; posterior lobe of pronotum and scutellum coarsely punctate ; corium with some coarse punctures on basal area ; antennae with the first, second, and third joints pilose.

Length, 8 mm.

Telôm, Perak-Pahang boundary. 4,000 feet. January, 1902.

100. *Dysdercus simplex*

Dindymus simplex, *Walk. Cat. Het.* vi, p. 6 (1873).

Dysdercus decorus, *Bredd. Zeit. für Entomologie*, 1901, p. 115.

Dysdercus simplex, *Dist. Ann. Mag. Nat. Hist.* (7) ix, p. 42 (1902).

Tanjong Patani, Jhering. 29th September, October, 1901.

‘Common on trunks of casuarina trees by the sea.’

Also recorded from Sikkim, Nicobars, and several islands of the Malayan Archipelago.

101. *Dysdercus cingulatus*

Cimex cingulatus, *Fabr. Syst. Ent.*, p. 719 (1775) ; *Goeze. Ent. Beytr.* ii, p. 256 (1778).

For full synonymy cf. *Leth. and Sev. (excl. poecilus H.S.) Cat. Gen. Hem.* ii, p. 252 (1894).

Biserat, Jalor. June, July, October, 1901.

‘At light, and on flowers.’

Jhering, Jambu.

June, 1901.

Bukit Besar, Nawngchik. 500 feet.

May, 1901.

Bidor, South Perak.

February, 1902.

Sungkei, South Perak.

February, 1902.

‘This species is one of the commonest and most conspicuous of the Heteroptera in the Patani States, though scarcer and more local in Perak. It is mimicked very closely indeed by the longicorn *Rhaphuma placida*, PASC., of which a single specimen was brought us by a native, together with one of the bug. The beetle is widely distributed throughout the Malay Archipelago, ranging at least as far as Celebes, but does not appear to have been hitherto recorded from the Peninsula, where it must be rare, as only a single specimen was met with.’



Widely distributed throughout British India and the Malayan Archipelago, and recorded from China.

102. *Dysdercus poecilus*

Pyrrhocoris poecilus, *Herr.-Schäff. Wanz. Ins.* vii, p. 17, fig. 699 (1844).

Dysdercus poecilus, *Bredd. Wien. Entomol. Zeit.* xx, p. 85 (1901); *Dist. Ann.*

Mag. Nat. Hist. (7) ix, p. 42 (1903).

Dysdercus concinnulus, *Walk. Cat. Het.* vi, p. 11 (1873).

Biserat, Jalor. 29th June, 1901.

Bidor, South Perak. February, 1902.

A variable species widely distributed in the Malayan Archipelago.

'In both cases found with the preceding species.' N.A.

TINGIDIDAE

Penottus, gen. nov.

Head exposed, no pronotal hood; head without spines, but with three small rounded tubercles on disk behind the insertion of the antennae, which have the first joint strongly incrassate, longer than the second, which is also less incrassate; third joint much the longest and slender; fourth, nearly half the length of the third, cylindrical, pilose; head beneath and sternum sulcate; pronotum, with the exception of the posterior prolongation, consisting of two very large globular processes separated narrowly, centrally, and longitudinally; these processes are covered with pentagonal cells, most of which have a distinct central indentation; posterior pronotal prolongation flat, finely areolate, centrally carinate, its margins also carinate; elytra widening from near base; apical margins rounded, finely areolate; the areolets larger on lateral and apical areas; sutural area very large; discoidal, subcostal, and costal areas distinct; elytra much longer than abdomen.

103. *Penottus jalorensis*, sp. nov.

(Pl. XV)

Head, pronotal processes, sternum, and abdomen beneath, piceous; posterior pronotal prolongation and the elytra creamy white, thickly covered with small fuscously coloured areolets; lateral elytral margins with a distinct fuscous spot near middle and near apex; abdomen above pale purplish red; antennae luteous, with the apical joint black; coxae trochanters and legs ochraceous, apices of tibiae and the tarsi fuscous.

Length, $3\frac{1}{2}$ mm.

Mabek, Jalor. 24th July, 1901.

'Among low shrubs at the edge of rice fields.'

PHYMATIDAE

104. *Carcinochelis determinatus*, sp. nov.

(Pl. XV)

Pale ochraceous ; eyes, apical joint of antennae, posterior lobe of pronotum and scutellum, pale fuscous ; margins and a central line to scutellum luteous ; abdomen above luteous, disc of apical area testaceous, a large central and small subapical, marginal fuscous spot ; corium creamy white, finely speckled with fuscous, the apical angle piceous, membrane pale fuliginous, body beneath and legs pale ochraceous ; anterior tarsal claws, intermediate and posterior tibia and tarsi fuscous ; first and second joints of antennae short, incrassate, third slender-apically clavate, apical joint thick fusiform ; head above granulate, its lateral margins obtusely crenulate ; anterior pronotal area finely spinous and with about six more prominent and suberect spines ; abdomen rounded centrally and attenuated posteriorly, the connexival margin finely serrate but not angulate.

Length, $6\frac{1}{2}$ mm.

Mabek, Jalor. July 25th, 1901.

'On upper surface of leaves of low shrubs in jungle.'

This is the second time this genus has been accurately localized ; the type *C. alutaceus* being without a habitat.

105. *Glossopelta* sp.

One immature form from Biserat.

ARADIDAE

106. *Brachyrhynchus membranaceus*

Aradus membranaceus, *Fabr. Syst. Rbyng.*, p. 118 (1803).

Brachyrhynchus membranaceus, *Stål. Hem. Fabr.* i, p. 96 (1868).

Aradus albipennis, *Fabr. Syst. Rbyng.*, p. 118 (1803).

Brachyrhynchus albipennis, *Stål. Hem. Fabr.* i, p. 96 (1868).

Brachyrhynchus orientalis, *Lap. Ess. Hem.* p. 54 (1832) ; *Amy. and Serv. Hem.* p. 305 (1843).

Dysodius membranaceus. *Herr.-Schäff. Wanz. Ins.* p. 122, fig. 887 (1848).

Crimia niger, *Dobrn. Stett. Ent. Zeit.* xxi, p. 406 (1860).

Aradus lugubris, *Boisd. Voy. Astrol. Ins.* ii, p. 642, pl. ii, fig. 24 (1835).

Brachyrhynchus nasutus, *Stål. Öfv. Vet. Ak.-Förb.*, 1870, p. 673.

Kuala Lumpur, Selangor. April, May, 1902. (At light).

Widely distributed throughout British India and the Malayan Archipelago.

107. Neuroctenus serrulatus

Neuroctenus serrulatus, *Stål. Öfv. Vet.-Ak. Förb.*, 1870, p. 674; *Berggr. Öfv. Finska Vet. Soc. Förb.* xxix, p. 179 (1887).

Jeram Kawan, South Perak. February, 1902.

'In large numbers under bark of dead tree, with larvae.'

Also recorded from Java, Ceylon, and the Philippines.

HYDROMETRIDAE**VELINAE****108. Rhagovelia insignis**, sp. nov.

(Pl. XV)

Purplish black; pronotum with two transverse ochraceous spots near anterior margin; hemelytra with four silvery white spots—one largest and elongate at base, two on posterior disk, and one at apex; besides these there is an obscure whitish claval streak and an obscure minute spot above and between the two discal spots; antennae piceous pilose; legs and rostrum brownish ochraceous; apex of rostrum piceous; antennae with the first and second joints stoutest, shortest, and subequal; third and fourth longest and subequal; tarsi with the first joint a little longer than the second.

Length, $3\frac{1}{2}$ mm.

Bukit Besar, Nawngchik. 2,500 feet. 24th August, 1901.

'Running in great numbers on the surface of small pools of rain-water collected between the buttresses of jungle tree.'

109. Perittopus rufus

Perittopus rufus, *Fieb. (ined.) Dist. Faun. Brit. Ind. Rbynch.* ii, p. 175, fig. 128 (1903).

Sempan, Selangor-Pahang boundary. 4,000 feet. May, 1902.

Also found in Tenasserim.

GERRINAE**110. Gerris fossarum**

Cimex fossarum, *Fabr. Syst. Ent.*, p. 727 (1775); *id. Spec. Ins.* ii, p. 375 (1781); *Id. Mant. Ins.* ii, p. 308 (1787).

Gerris fossarum, *Fabr. Ent. Syst.* iv, p. 188 (1794); *Wolff. Ic. Cim.* p. 118, pl. xii, fig. 112 (1802).

Hydrometra fossarum, *Fabr. Syst. Rbyng.*, p. 258 (1803).

1. Cf. *antea*, Part I, p. 149, under *Gonatodestaffinis*.

Limnogonus fossarum, *Stål. Hem. Fabr.* i, p. 133 (1868).

Gerris discolor, *Stål. Freg. Eug. Resa. Ins.*, p. 265 (1859).

Tanjong Patani, Jhering. 30th September, 1901.

‘Running and leaping on the surface of a small pool.’

Sungkei, South Perak. February, 1902. (At light).

111. *Ptilomera laticaudata*

Gerris laticaudata, *Hardw. Trans. Linn. Soc.* xiv, p. 134, pl. vi, figs. 1-4 (1825).

Ptilomera laticaudata, *Amy. and Serv. Hem.*, p. 414, pl. viii, fig. 3 (1843);

Herr.-Schäff. Wanz. Ins. ix, p. 65, fig. 940 (1853).

Ptilomera cingalensis, *Stål. Öfv. Vet.-Ak. Förb.* xii, p. 190 (1856).

Ptilomera tigrina, *Ubler. Proc. Acad. Philad.*, 1860, p. 230.

Bukit Besar, Nawngchik. 2,500 feet. 25-26th August, 1901.

‘Running on surface of clear jungle stream in shade.’

112. *Metrocoris nigrofasciatus* sp. nov.

(Pl. XV)

Ochraceous; a discal spot on head; eyes, anterior and posterior margins, and a central longitudinal fascia to pronotum, the last extending through the mesonotum, which also has two slightly curved fasciae on each lateral area of its anterior half, and two sinuate transverse fasciae crossing its posterior half, which are united a little before lateral margins, margins of abdominal segments above, a longitudinal lateral basal marginal line to abdomen beneath, a small linear spot at base and apex of intermediate coxae beneath, a longitudinal fascia to posterior coxae above, two longitudinal fasciae to anterior femora above, anterior tibiae and tarsi, antenniferous tubercles, antennae, excluding base, a spot at base and the apex to rostrum, black; intermediate and posterior legs somewhat brownish ochraceous. Ovate, widest behind the middle; head broadly convex; anterior femora stout, moderately curved, with a stout tuberculous tooth near apex; anterior tibiae stout, about as long as femora; intermediate femora longer and a little stouter than the posterior femora.

Length, ♂ 6 mm.

Bukit Besar, Nawngchik. 2,500 feet. 26th August, 1901.

‘Running on the surface of clear jungle stream in shade.’

113. Halobates sexualis, sp. nov.

(Pl. XV)

♂. Silvery-grey; eyes, antennae, and rostrum black; two basal spots almost meeting in centre and reaching eyes; lateral and apical margins of abdomen, base of antennae, head beneath, disk of prosternum, anterior coxae and trochanters, large spot near intermediate coxae, intermediate and posterior coxae beneath, and anal appendage beneath, luteous; legs blackish-grey.

♀. Silvery-grey above; posterior margins of pronotum, mesonotum, and metanotum and a central line extending through pronotum to basal half of abdomen, chocolate-brown; body beneath ochraceous, an oblique piceous fascia before the intermediate coxae.

Antennae with the first joint about as long as the three remaining joints together, which are almost subequal in length; intermediate legs longer and a little stouter than posterior legs; intermediate tibiae about as long as posterior femora.

Length, ♂ $4\frac{1}{2}$; ♀ $3\frac{1}{2}$ mm.

Estuary of the Jambu River, Jhering. 10th June, 1901.

REDUVIIDAE**EMESINAE****Ploiariaria****114. Ploiariola contaminata, sp. nov.**

(Pl. XVI)

Very pale luteous; abdomen, excluding basal third, above and beneath dark fuscous; eyes black; anterior coxae with two broad annulations, anterior femora and tibiae with three broad annulations, brownish-ochraceous; hemelytra creamy-white, much mottled, with pale fuscous; a small subapical spot to first joint of antennae, three or four similar spots to intermediate and posterior femora, and a subbasal spot to intermediate and posterior tibiae, piceous; first joint of antennae about as long as abdomen; head, anterior pronotal lobe, and anterior legs longly pilose; posterior femora slightly passing abdominal apex.

Length, 6 mm.

Biserat, Jalor.

Leistarcharia**115. Luteva malayana, sp. nov.**

(Pl. XVI)

Pale luteous; lateral margins of pro- and mesonota and the intermediate and posterior less fuscous; hemelytra creamy-white with a rather large pale slaty-coloured spot in the membranal cellular spaces; eyes black;

first joint of antennae longer than abdomen, scarcely longer than second joint; hemelytra about reaching abdominal apex; posterior femora as long as body including head, considerably passing abdominal apex.

Length, 7 mm.

Biserat, Jalor. 18th October, 1901.

'At light. Rested on support of lamp shade, and swayed its body up and down after the manner of a tipulid.'

STENOPODINAE

116. *Pygolampis macera*

Pygolampis macera, *Walk. Cat. Het.* viii, p. 37 (1873).

Biserat, Jalor. 9th July, 1901.

'From low vegetation on waste ground.'

Originally described from Malacca.

117. *Canthesancus gulo*

Canthesancus gulo, *Stål. Ann. Soc. Ent. Fr.*, 1863, p. 44.

Sungkei, South Perak. February, 1902.

Originally described from Malacca; found in Assam.

SALYAVATINAE

118. *Petalochirus fasciatus*, sp. nov.

(Pl. XVI)

Piceous: two slightly curved longitudinal fasciae to posterior lobe of pronotum, corium, and large spots to connexivium, above and beneath, pale ochraceous; clavus and claval area of corium mottled with fuscous; apical margin of corium irregularly black; membrane fuscous mottled with ochraceous; sternum piceous; abdomen beneath ochraceous, with a dark piceous central fascia and a broader and paler piceous sublateral fascia, marginal abdominal spines black; legs dark obscure castaneous, inner margins of anterior tibiae and the intermediate and posterior tibiae ochraceous, the last with basal, apical, and medial piceous annulations; antennae with the first and second joints piceous, remainder mutilated; first joint obscurely annulated with castaneous; spines at antenniferous tubercles and lateral pronotal, angles long, obliquely directed upward, anterior pronotal angles prominently spinous, scutellar spine erect, long, slightly directed backward; abdominal marginal spines long, a little curved backward; abdomen above, pale sanguineous.

Length, 15-16 mm.

Biserat, Jalor. 3rd July, 1900.

119. *Petalochirus spinosissimus*, sp. nov.

(Pl. XVI)

Head, pronotum, scutellum, body beneath, and legs, brownish-castaneous; corium, marginal spots to connexivium, above and beneath, and intermediate and posterior tibiae ochraceous, the last with basal, apical, and medial piceous annulations; clavus and claval and apical areas of corium mottled with fuscous; a black and much sinuated spot on inner apical margin of corium; lateral pronotal spines very long and robust, directed upward and forward, a little curved toward apices; abdominal spines, long, robust, straight, moderately directed backward.

Length, $13\frac{1}{2}$ mm.

Biserat Jalor.

ACANTHASPINAE**120. *Alloeocranum maculosum*, sp. nov.**

(Pl. XVI)

Ochraceous, mottled with fuscous, the membrane more finely and thickly mottled; base and apex of clavus, basal, apical, and two spots at inner angle of corium, and broken basal margin to membrane, creamy-white; femora and tibiae biannulated with fuscous; antennae mutilated; connexivum ochraceous, with a series of small marginal fuscous spots, above and beneath.

Allied to *A. biannulipes*, but distinct by the altogether different corium and membrane, which is constant in all the specimens I have examined from different parts of the world in MONTROUZIER and SIGNORET's species; from *A. quadrisinatus*, Reut., it differs by its annulated legs.

Length, $6\frac{1}{2}$ mm.

Gedong, South Perak. January, 1902.

'Found on bark of tree in jungle.'

121. *Gerbelius confluens*, sp. nov.

(Pl. XVI)

Ochraceous: head, pronotum, scutellum, posterior half of corium, membrane, sternum, and broad sublateral margins to abdomen beneath, black; a broad subapical annulation to femora, and spots to connexivium above and beneath, castaneous; posterior lateral angles to pronotum, and apex of scutellum, ochraceous; antennae and basal joint of rostrum, brownish ochraceous; posterior angles of the first, second, third, and fourth abdominal

segments prominently spinous ; anterior femora with short robust spines beyond middle of under surface ; first joint of antennae shorter than the antecular portion of head ; second joint about as long as head ; pronotum, with the lateral margins, strongly sinuate ; centrally, profoundly sulcate ; lateral angles roundly subprominent.

Length, 7 mm.

Bukit Besar, Nawngchik. 2,500 feet.

122. *Velitra rubropicta*

Opinus rubropictus, *Amy. and Serv. Hem.*, p. 339 (1843).

Platymeris discolor, *Herr.-Schäff. Wanz. Ins.* viii, p. 31, fig. 805 (1848).

Reduvius rivulosus, *Walk. Cat. Het.* vii, p. 194 (1873).

Velitra rubropicta, *Stål. En. Hem.* iv, p. 69 (1874) ; *Dist. Ann. Mag. Nat. Hist.* (7) x, p. 189 (1902).

Biserat, Jalor. July, 1901.

'On labiate herbs and at light. When handled inflicts a painful sting, the effect of which lasts for about half an hour. At the same time the insect emits a powerful odour of the usual kind.'

Generally distributed from India to several islands of the Malayan Archipelago.

123. *Sminthus singularis*

Reduvius singularis, *Walk. Cat. Het.* vii, p. 198 (1873).

Sminthus singularis, *Dist. Ann. Mag. Nat. Hist.* (7) x, p. 189 (1902).

Tapinus heydeni, *Bredd. Wien. Ent. Zeit.* xxi, p. 23 (1902).

Jeram Kawan, South Perak. 15th February, 1902.

'Under bark of dead tree.'

124. *Sminthus fuscipennis*

Sminthus fuscipennis, *Stål. En. Hem.* iv, p. 68 (1874).

Semangko Pass, Selangor-Pahang boundary. 2,700 feet. May, 1902. (Under bark).

Received also from Assam and Sikkim.

125. *Staliastes rufus*

Tapinus rufus, *De Casteln. Ess. Hem.*, p. 82 (1832).

Tapinus rufus, *Burm. Handb.* ii, p. 236 (1835).

Opinus rufus, *Amy. and Serv. Hem.*, p. 340, pl. vii, fig. 3 (1843).

Opinus semicostalis, *Walk. Cat. Het.* viii, p. 4 (1873).

Staliastes rufus, *Dist. Ann. Mag. Nat. Hist.* (7) x, p. 190 (1902).

Bukit Besar, Nawngchik. 2,500 feet. 18th May, 1901.

'Under bark of dead tree in jungle.'

A common Javan insect.

PIRATINAE

126. *Ectomocoris atrox*

Pirates atrox, *Stål. Öfv. Vet.-Ak. Förh.*, 1855, p. 187.

Pirates diffinis, *Walk. Cat. Het.* vii, p. 120 (1873).

Pirates ypsilon, *Kirby, Journ. Linn. Soc. Zool.* xxiv, p. 113, pl. iv, fig. 8 (1891).

Pirates stigmativentris, *Kirby, loc. cit.*, p. 112 (*immature form*).

Ectomocoris atrox, *Dist. Ann. Mag. Nat. Hist.* (7) x, p. 282 (1902).

Also distributed through British India, Cochin China, and Java.

Sungkei, South Perak. February, 1902.

ECTRICHODINAE

127. *Caecina spinulosa*

Caecina spinulosa, *Stål. Ann. Soc. Ent. Fr.*, 1863, p. 48.¹

Bukit Besar, Nawngchik. 2,500 feet. 30th August, 1901.

'On leaves of wild bananas.'

Found also in Cambodia and Borneo.

128. *Ectrychotes coloratus*

Larymna colorata, *Mayr. Verb. Zool. Bot. Ges. Wien.* xv, p. 439 (1865);

id. Reise Novara Hem., p. 157, fig. 43 (1866).

Ectrychotes coloratus, *Stål. En. Hem.* iv, p. 51 (1874).

Kampong Jalor, Jalor. 5th November, 1901.

'On blades of grass above the surface of flooded rice fields.'

Received also from Java and Borneo.

129. *Ectrychotes*, sp.

One specimen representing a species or variety near *E. atripennis*, *Stål.*

Bukit Besar, Nawngchik. 2,500 feet.

1. Breddin (*Zool. Anzeig.* xxvi, p. 508 (1903), has apparently recently redescribed Stål's genus *Caecina* under the name of *Camelocastra*. He has also described two species, one of which, *Camelocastra javana*, is probably the *C. spinulosa*, Stål., as enumerated above.

130. *Vilius macrops*

Ectrichodia macrops, *Walk. Cat. Het.* viii, p. 48 (1873).

Vilius macrops, *Dist. Ann. Mag. Nat. Hist.* (7) x, p. 292 (1902).

Biserat, Jalor. 3rd July, 1901. (At light).

Originally described from Siam.

APIOMERINAE**131. *Amulius longiceps***

Amulius longiceps, *Stål. Öfv. Vet.-Ak. Förh.*, 1866, p. 246.

Bukit Besar, Nawngchik. 300 feet. 10th May, 1901.

'Feeds on the sticky exudation of certain jungle trees, and is usually covered with this substance.'

HARPACTORINAE**132. *Harpactor fuscipes***

Reduvius fuscipes, *Fabr. Mant. Ins.* ii, p. 312, 33 (1787); *Stål. Hem. Fabr.* i, p. 110 (1868).

Reduvius sanguinolentus, *Wolff. Ic. Cim.* iv, p. 166, fig. 160 (1804).

Reduvius corallinus, *Lep. and Serv. Encycl. Meth.* x, p. 279 (1825).

Reduvius costalis, *Stål. Öfv. Vet. Ak.-Förh.*, 1866, p. 285.

Harpactor bicoloratus, *Kirby, Journ. Linn. Soc. Zool.* xxiv, p. 119 (1891).

Harpactor fuscipes, *Dist. Ann. Mag. Nat. Hist.* (7) xi, p. 205 (1903).

Ban Sai Kau, Nawngchik. 19th-23rd May, 1901.

Widely distributed throughout the Oriental region.

133. *Harpactor chersonesus*

Harpactor chersonesus, *Dist. Ann. Mag. Nat. Hist.* (7) xi, p. 207 (1903).

Ban Sai Kau, Nawngchik. 19th-23rd May, 1901.

Biserat, Jalor. 17th October, 1901.

'The specimens from Biserat were found on a flowering shrub, and one individual was observed feeding on a small black bee (*Trigona*,¹ sp.), which it closely resembled when on the wing. If this is really an instance of what has been termed *aggressive* resemblance the case is extremely interesting, for the same bee is also said to be mimicked for purposes of *protection* by a small longicorn (*Epania singaporensis*), which was captured on the same shrub.'

1. *Melipona vidua*, Lepel (Cf. Shelford, *l.c.*)

Originally described from Penang and Burma. In some of the specimens collected by Messrs. ANNANDALE and ROBINSON the dull reddish apical marginal area of the corium is confined to the apical angle, and in other specimens is practically absent. It is quite possible that varietal forms may be discovered to link this species with *H. flavus*, DIST.

134. Harpactor vicinus

Reduvius vicinus, Stål. *Öfv. Vet. Ak.-Förh.*, 1859, p. 202.

Reduvius (*Lamphrius*) *sericans*, Reut. *Act. Soc. Sc. Fenn.* xii, p. 293 (1881).

Bukit Besar, Nawngchik. 2,500 feet. 10th May, 1901.

Also found in Borneo, Sumatra, and several other islands of the Malayan Archipelago.

135. Vesbius purpureus

Cimex purpureus, Thunb. *Nov. Ins. Sp.* iii, p. 57, fig. 67 (1784).

Reduvius purpureus, Thunb. *Hem. rostr. Cap.* iii, p. 4 (1822).

Harpactor milthinus, Herr.-Schäff. *Wanz. Ins.* viii, p. 82, fig. 850 (1848).

Vesbius purpureus, Stål. *En. Hem.* iv, p. 36 (1874).

Biserat, Jalor. August, 1901.

Somewhat widely distributed in the Oriental region, and known from China.

136. Vesbius sanguinosus

Vesbius sanguinosus, Stål. *En. Hem.* iv, p. 36 (1874).

Sungkei, South Perak. February, 1902.

Gedong, South Perak. January, 1902.

Described from Java, and known from Assam.

137. Cosmolestes picticeps

Reduvius picticeps, Stål. *Öfv. Vet.-Ak. Förh.*, 1859, p. 204.

Cosmolestes picticeps, Stål. *En. Hem.* iv, p. 32 (1874).

Patani. 21st June, 1901.

Biserat, Jalor. June, July, 1901.

Found extensively throughout the Oriental region.

138. Velinus malayus

Reduvius malayus, Stål. *Ann. Soc. Ent. Fr.*, 1863, p. 37.

Velinus malayus, Stål. *En. Hem.* iv, p. 31 (1874).

Bukit Besar, Nawngchik.	2,500 feet.	1st May, 1901.
Ban Sai Kau, Nawngchik.		19th-23rd May, 1901.
Biserat, Jalor.		June, July, 1901.

Originally described from Malacca.

139. *Velinus nigrigenu*

- Euagoras nigrigenu*, *Amy. and Serv. Hém.*, p. 369 (1843).
Reduvius nigrigenu, *Stål. Öfv. Vet.-Ak. Förh.*, 1859, p. 204.
Velinus satellitius, *Stål. Öfv. Vet.-Ak. Förh.*, 1866, p. 281.
Velinus nigrigenu, *Stål. En. Hém. iv.*, p. 32 (1874).

Jalor.		July, 1901.
Jor, South Perak.	2,000 feet.	January, 1901.

Received from both Malacca and Java.

140. *Arcesius bicolor*, sp. nov.

(Pl. XVI)

Black, shining; apical angle of corium, membrane, and abdomen above and beneath, golden-yellow; head about as long as pronotum; first joint of antennae about as long as head; pronotum with the anterior angles tuberculous, the anterior lobe gibbous, tuberculate, centrally sulcate, posterior lobe rugose, lateral and posterior angles prominent, and with two distinct tubercles on posterior disc; femora subnodulose near apices.

Length, 15 mm.

Bukit Besar, Nawngchik.

141. *Sycanus collaris*

- Reduvius collaris*, *Fabr. Spec. Ins.* ii, p. 380 (1781); *Mant. Ins.* ii, p. 312 (1787).
Zelus collaris, *Fabr. Syst. Rhyng.*, p. 285 (1803).
Arilus collaris, *Burm. Handb.* ii, p. 229 (1835); *Herr.-Schäff. Wanz. Ins.* viii, p. 37, fig. 813 (1848).
Sycanus collaris, *Dobrn. Stett. Ent. Zeit.* xx, p. 98 (1859); *Stål. En. Hém. iv.*, p. 28 (1874); *Dist. Ann. Mag. Nat. Hist.* (7) ii, p. 212 (1903).
Cimex carbonarius, *Gm. Syst. Nat.* i, iv, p. 2199 (1788).
Reduvius longicollis, *Lep. and Serv. Encycl. Méth.* x, p. 278 (1825).
Sycanus leucomesus, *Walk. Cat. Hétt.* viii, p. 84 (1873).

Biserat, Jalor.	August, 1901.
Sungkei, South Perak.	February, 1902.
Jeram Kawan, South Perak.	February, 1902.
Gedong, South Perak.	January, 1902.

Recorded from India, Ceylon, and Malacca.

142. Eulyes amoena

Reduvius amoena, *Guér. Ic. Ins.*, p. 350, pl. lvi, fig. 17 (1838).

Arilus amoenus, *Herr.-Schäff. Wanz. Ins.* vi, p. 91, fig. 662 (1842).

Eulyes amoena, *Amy. and Serv. Hém.*, p. 359, pl. vi, fig. 10 (1843); *Dobrn. Stett. Ent. Zeit.* xx, p. 93 (1859).

Sungkei, South Perak. February, 1902.

Gedong, South Perak. January, 1902.

Known from Java and Borneo.

143. Macranthopsis nodipes

Macranthopsis nodipes, *Reut. Act. Soc. Sc. Fenn.* xii, p. 283 (1881).

Jeram Kawan, South Perak. 13th February, 1902.

‘Flying about in undergrowth, and closely resembling a small Hymenopteron.’

Found in Assam.

144. Euagoras sordidatus

Euagoras sordidatus, *Stål. Öfv. Vet.-Ak. Förb.*, 1866, p. 273.

Bukit Besar, Nawngchik. 2,500 feet. May, August, 1901.

‘Flying about among long grass at dusk.’

Also received from Java and Borneo.

145. Euagoras plagiatus

Zelus plagiatus, *Burm. Nova Acta Ac. Nat. Cur.* xvi, *Suppl.* i, p. 303 (1834).

Euagoras plagiatus, *Stål. Stett. Ent. Zeit.* xxii, p. 136 (1861); *En. Hem.* iv, p. 24 (1874).

Darbanus nigrolineatus, *Amy. and Serv. Hem.* i, p. 371 (1843).

Jeram Kawan, South Perak. 14th February, 1902.

‘Common among long grass and ferns in deserted clearings; flies about at sunset.’

Also found in Tenasserim, and in many islands of the Malayan Archipelago.

146. Endochus nigricornis

Endochus nigricornis, *Stål. Öfv. Vet.-Ak. Förb.*, 1859, p. 194; *Reut. Act. Soc. Sc. Fenn.* xii, p. 280 (1881).

Sungkei, South Perak. February, 1902.

Also received from Silhet and Java.

147. Astinus m-album

Ploeogaster m-album, *Amy. and Serv. Hem.*, p. 364, pl. 6, fig. 8 (1843).

Astinus m-album, *Stål. En. Hem.* iv, p. 22 (1874).

Ploeogaster modestus, *Stål. Öfv. Vet.-Ak. Förh.*, 1854, p. 238.

Jalor.

Somewhat common in Borneo.

148. Panthous daedalus

Panthous daedalus, *Stål. Ann. Soc. Ent. Fr.*, 1863, p. 42.

Semangko Pass, Selangor-Pahang boundary. 2,700 feet. May, 1902.

Originally described from Malacca.

149. Panthous icarus

Panthous icarus, *Stål. Ann. Soc. Ent. Fr.*, 1863, p. 42.

Mabek, Jalor. 25th July, 1901.

Originally described from Malacca.

150. Scipinia horrida

Sinea horrida, *Stål. Freg. Eug. Resa Ins.*, p. 262 (1859).

Sinea paltastes, *Dohrn. Stett. Ent. Zeit.* xxi, p. 406 (1860).

Scipinia horrida, *Stål. En. Hem.* iv, p. 15 (1874).

Mabek, Jalor. 26th July, 1901.

Recorded from Ceylon, the Philippines, and Japan.

151. Irantha biseratensis, sp. nov.

(Pl. XVI)

Reddish ; ochraceous, abdomen beneath stramineous ; head, antennae, rostrum, sternum, excluding lateral margins, lateral margins and apex of abdomen, piceous or black ; abdomen above piceous, connexivum stramineous ; head, with a long erect spine behind each antenniferous tubercle, remaining upper surface of head tuberculate, but not spinous ; pronotum with the anterior lobe sculptured, posterior lobe moderately rugose ; first joint of rostrum passing eyes, considerably longer than the second joint ; femora strongly nodulose ; anterior femora with two long piceous spines beneath, near apex.

Length, 10 mm.

NABINAE

152. *Psilistus corallinus*

Psilistus corallinus, *Stål. En. Hem.* iii, p. 109 (1873).

Telôm, Perak-Pahang boundary. 4,000 feet. 18th January, 1902.

Originally described from Borneo.

153. *Nabis telomi*, sp. nov.

(Pl. XVI)

Pale, metallic, grassy-green ; head, antennae, rostrum, body beneath and coxae pale ochraceous ; disc of metasternum and base of abdomen, carmine-red ; scutellum piceous, its apex ochraceous ; eyes and ocelli dull reddish-brown ; pronotum with three fuscous spots on posterior margin ; corium with the base luteous and a small fuscous spot near apex ; membrane pale fuliginous with a greyish oblong spot on inner and outer margins ; antennae with the basal joint green, remainder fuscous ; head with a central fuscous line on the anteocular portion, and a similar but shorter line on the postocular portion ; first joint of antennae almost as long as head and pronotum together, slightly shorter than the second ; legs distinctly and somewhat longly pilose.

Length, 6 mm.

Telôm, Perak-Pahang boundary. 4,000 feet. 19th January, 1901.

CAPSIDAE

154. *Kosmiomiris lucidus*

Capsus lucidus, *Walk. Cat. Het.* vi, p. 124, 294 (1873).

Kosmiomiris rubroornatus, *Kirk. Trans. Ent. Soc.*, 1902, p. 253, pl. vi, Fig. 6.

Bukit Besar, Nawngchik. 2,500 feet. 18th May, 1901.

'From low vegetation in swamp at the edge of jungle.'

Originally described from Sarawak.

Guianerius, gen. nov.

Allied to *Kosmiomiris* from which it principally differs by the following characters :—The antennae are a little more robust, the first joint about the length of the pronotum, the second not quite the length of first, third and fourth short and slender, third longer than fourth, but together not so long as first ; head not distinctly longitudinally sulcate, as in *Kosmiomiris*, and the pronotum very much more obscurely punctate ; scutellum more elongate and much less callose.

155. *Guianerius typicus*, sp. nov.

(Pl. XVI)

Head, antennae, scutellum, clavus, and body beneath, black; base of first joint of antennae, anterior margin and posterior angular margins of pronotum, and a large elongate spot on apical area of scutellum, luteous; hemelytra hyaline, lateral margins of the coriaceous portion luteous, which has also a transverse apical and a transverse medial fuscous fascia; membranal venation fuscous; first joint of antennae, excluding base, and the posterior legs dull sanguineous; anterior and intermediate legs, luteous abdomen shrivelled in typical specimen.

Length, $7\frac{1}{2}$ mm.

Bukit Besar, Nawngchik. 2,500 feet. 9th May, 1901.

‘Hovering over flowers in jungle; flight and movements very wasp-like.’

156. *Lygus biseratensis*, sp. nov.

(Pl. XVI)

Pale obscure ochraceous, finely sericeous; apices of first, second, and fourth joints of antennae; eyes, a submarginal anterior line and a central longitudinal fascia to pronotum, black; cuneus fuscous brown; first and fourth, and second and third joints of antennae subequal in length.

Length, 7 mm.

Biserat, Jalor. July, 1901.

157. *Lygus bukitensis*, sp. nov.

(Pl. XVI)

Head, pronotum, scutellum, body beneath, and legs, luteous; the pronotum and scutellum glabrous and somewhat greenish-ochraceous; corium ochraceous; clavus, excluding base and an oblique transverse spot at base, and apex of cuneus, dark fuscous; membrane very pale fuliginous, the venation fuscous; antennae black, basal annulation to first and second joints, luteous.

Length $5\frac{1}{2}$ mm.

Bukit Besar, Nawngchik. 2,500 feet. 13th May, 1901.

‘From among low vegetation on jungle floor.’

158. *Disphinctus humeralis*

Monolonion humerale, *Walk. Cat. Het.* vi, p. 162 (1873).

Disphinctus humeralis, *Atkins. Ind. Mus. Notes*, i, p. 4 (1889).

Bukit Besar, Nawngchik. 2,500 feet. 13th May, 1901.

Originally described from Malacca. Also found in Assam and in Sikkim, where it attacks cinchona.

159. Helopeltis bradyi

Helopeltis bradyi, *Waterb. Trans. Ent. Soc.*, 1886, p. 458, pl. xi, figs. 1, 2.

Bukit Besar, Nawngchik. 2,500 feet. May, 1901.

'Flying in clearing in the middle of the day, and on flowers. Perhaps bearing a generalized resemblance to an ant.'

160. Helopeltis cuneata, sp. nov.

(Pl. XVI)

Luteous; scutellar spine and a spot at its base, fuscous brown; cuneus and apical third of abdomen black; antennae with the first and second joints luteous, remainder fuscous; legs luteous; the femora, more distinctly posterior femora, with fuscous mottlings; membrane pearly-grey, the venation fuscous; scutellar spine almost perpendicular.

Length, 6 mm.

Bukit Besar, Nawngchik. 2,500 feet. May, 1901.

'From sweep-net in undergrowth.'

By the entomologist, who is not especially searching for the insects of this family, they are obtained quite accidentally either in the sweep net among low jungle vegetation or flying in the sun around flowers.

BELOSTOMATIDAE**151. Sphaerodema rusticum**

Nepa rustica, *Fabr. Syst. Rbyng.*, p. 106 (1803).

Diplorhynchus rusticus, *Amy. and Serv. Hist. Hem.*, p. 436 (1843).

Sphaerodema rusticum, *Montand.*

Stoll., pl. vii, fig. 6.

Tanjong Patani, Jhering. 28th September, 1901.

'In small pools of fresh water in sand; very common.'

A wide ranging species throughout the Oriental and Australasian regions.

162. Amorgus indicus

Belostoma indica, *St. Farg. and Serv. Encycl. Meth.* x, p. 272 (1825).

Amorgus indicus, *Montand.*

Ban Sai Kau, Nawngchik. April and September, 1901.

'Large numbers of this big aquatic bug were brought to us by the natives at Ban Sai Kau, together with its eggs, which are laid in longitudinal

clusters around the stems of reeds and stiff grasses at the edges of the rice fields. The insects and eggs are used as an article of diet by both Malays and Siamese.'

Very widely distributed throughout the Oriental region.

NEPIDAE

163. *Laccotrephes ruber*

Nepa rubra (*rubra*), *Linn. Mus. Lud. Ultr.*, p. 165 (1764); *Fabr. Mant. Ins.* i, p. 277 (1787); *Ent. Syst.* iv, p. 62 (1794); *Syst. Rhyng.*, p. 107 (1803).

Nepa grossa, *Fabr. Ent. Syst.* iv, p. 62 (1794).

Laccotrephes ruber, *Stål. Hem. Fabr.* i, p. 135 (1868).

Ban Sai Kau, Nawngchik. September, 1901.

EXPLANATION OF PLATES

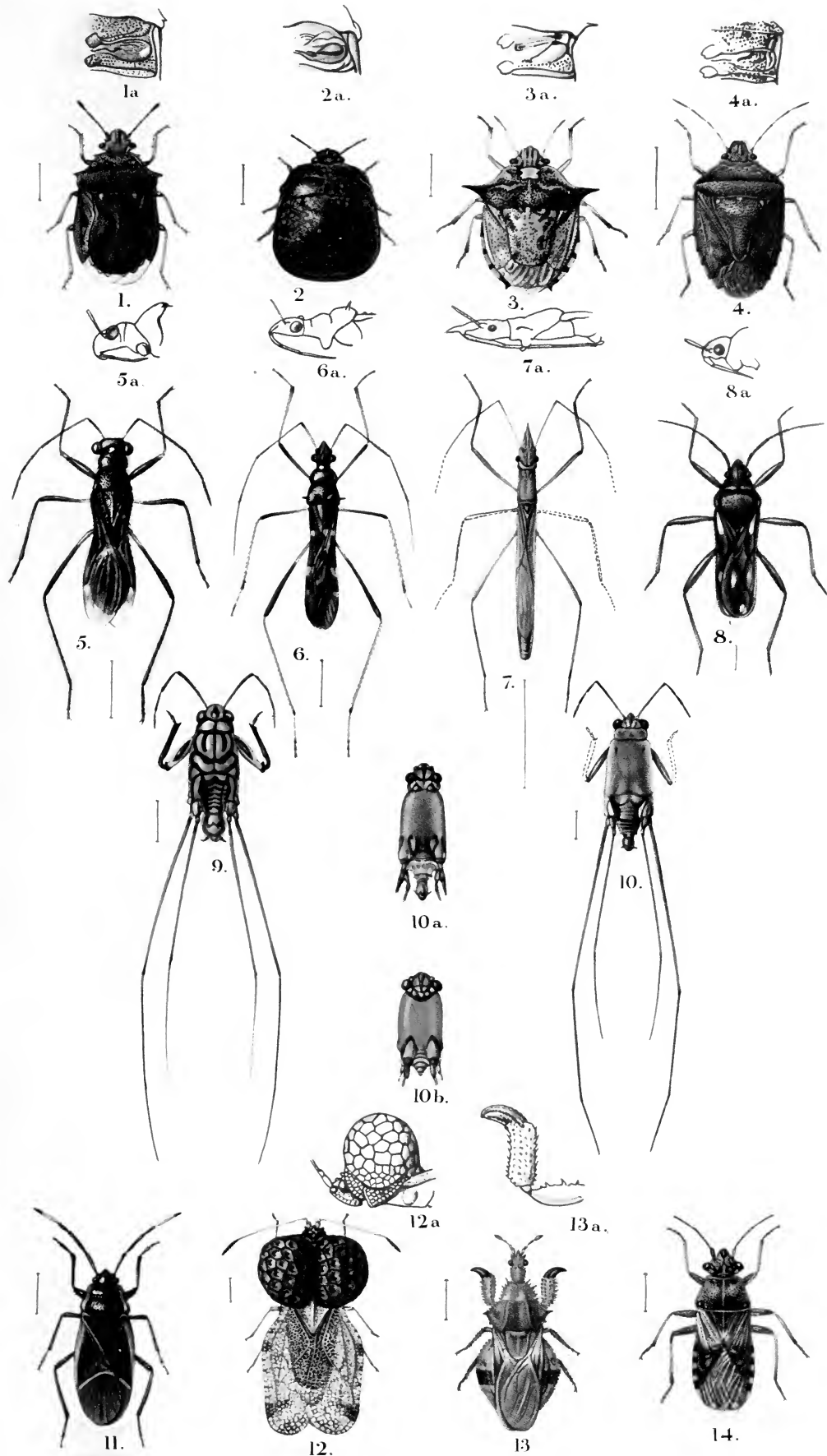
RHYNCHOTA HETEROPTERA

PLATE XV

- | | | | |
|--------------|--------------------------------|----------------|-----------------------------------|
| FIGS. 1, 1a. | <i>Podops malayensis</i> | FIG. 9. | <i>Metrocoris nigrofasciatus</i> |
| FIGS. 2, 2a. | <i>Tropidotylus annandalei</i> | FIG. 10. | <i>Halobates sexualis</i> |
| FIGS. 3, 3a. | <i>Stachyomia luteovaria</i> | FIG. 10a. | „ ♂ |
| FIGS. 4, 4a. | <i>Paterculus conspersus</i> | FIG. 10b. | „ ♀ |
| FIGS. 5, 5a. | <i>Artemidorus noctis</i> | FIG. 11. | <i>Delacampius typicus</i> |
| FIGS. 6, 6a. | <i>Porta gracilis</i> | FIGS. 12, 12a. | <i>Penottus jalorensis</i> |
| FIGS. 7, 7a. | <i>Acestra malayana</i> | FIGS. 13, 13a. | <i>Carcinochelis determinatus</i> |
| FIGS. 8, 8a. | <i>Rhagovelia insignis</i> | FIG. 14. | <i>Corizus robinsoni</i> |

PLATE XVI

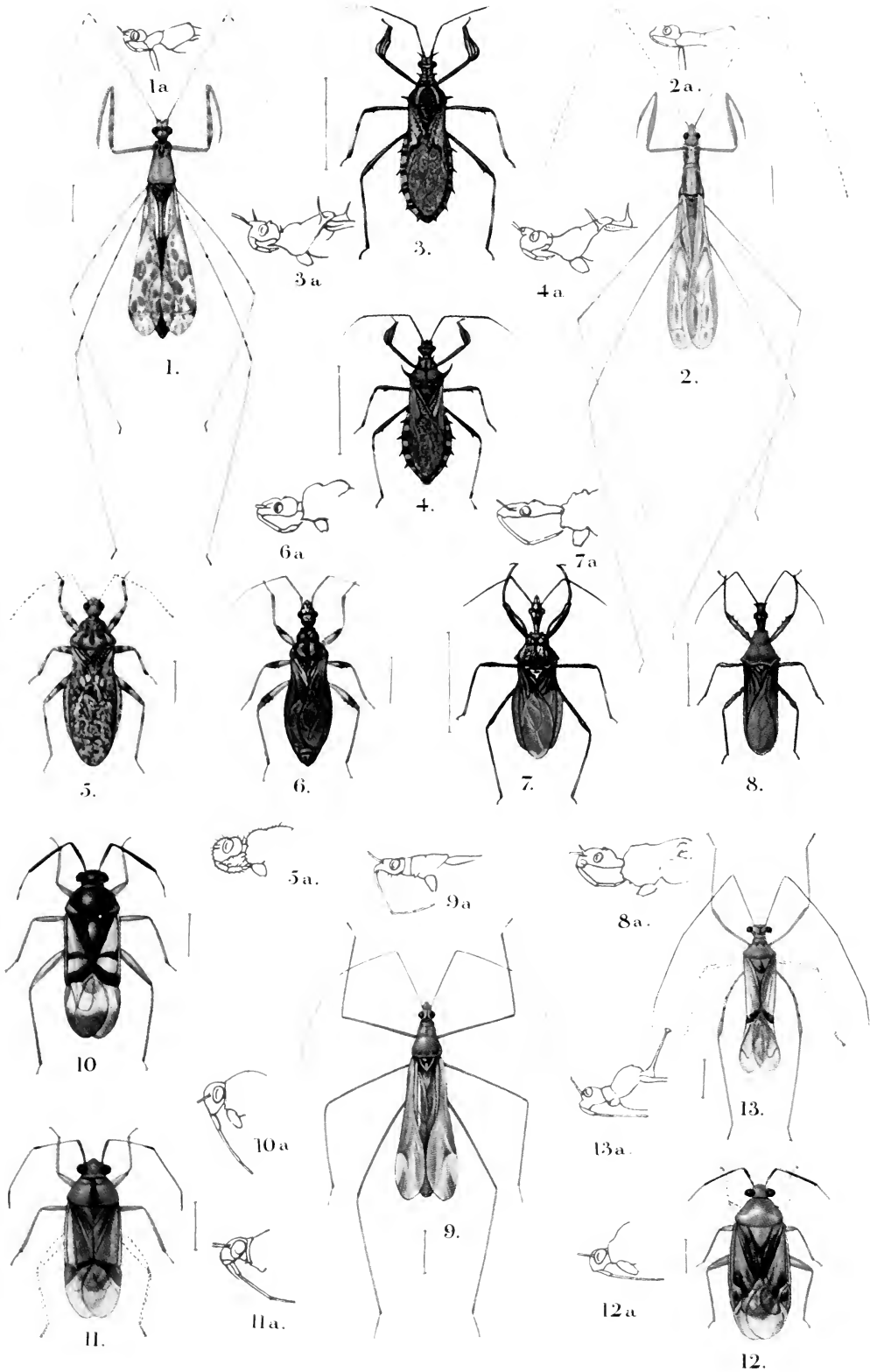
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|--------------|-------------------------------|----------------|-----------------------------|
| FIGS. 1, 1a. | <i>Ploiariola contaminata</i> | FIGS. 8, 8a. | <i>Irantha biseratensis</i> |
| FIGS. 2, 2a. | <i>Luteva malayana</i> | FIGS. 9, 9a. | <i>Nabis telomi</i> |
| FIGS. 3, 3a. | <i>Petalochirus fasciatus</i> | FIGS. 10, 10a. | <i>Guianerius typicus</i> |
| FIGS. 4, 4a. | „ <i>spinosissimus</i> | FIGS. 11, 11a. | <i>Lygus biseratensis</i> |
| FIGS. 5, 5a. | <i>Alloeocranum maculosum</i> | FIGS. 12, 12a. | „ <i>bukitensis</i> |
| FIGS. 6, 6a. | <i>Gerbelius confluens</i> | FIGS. 13, 13a. | <i>Helopeltis cuneata</i> |
| FIGS. 7, 7a. | <i>Arcesius bicolor</i> | | |



H. Knight del

Andre & Sleigh L^{td}





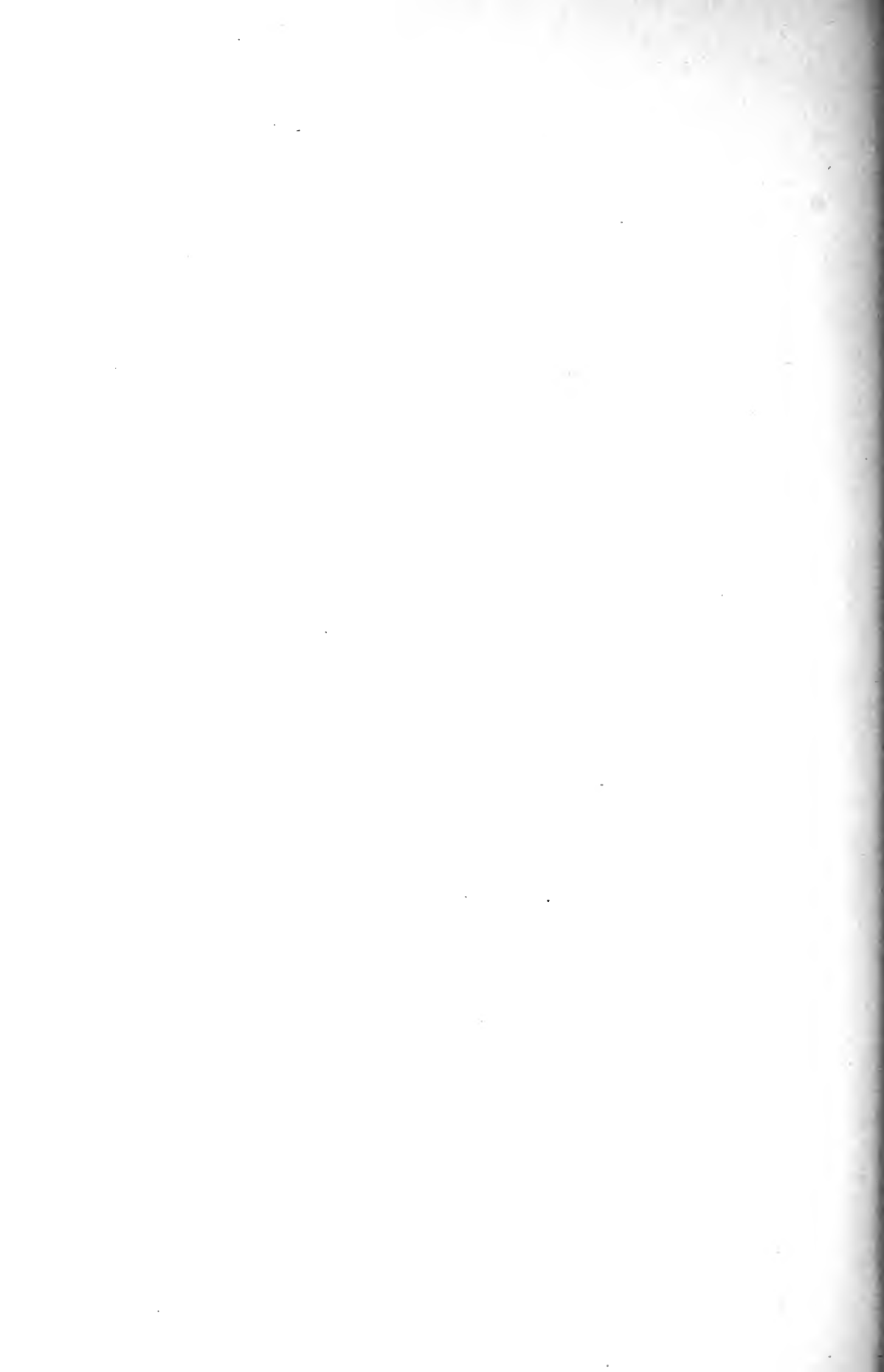
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THE STRUCTURE AND MECHANISM OF THE
FUNNEL SURROUNDING THE MOUTH IN THE
TADPOLE OF MEGALOPHRYS MONTANA

By NELSON ANNANDALE, B.A.



THE STRUCTURE AND MECHANISM OF THE FUNNEL SURROUNDING THE MOUTH IN THE TADPOLE OF MEGALOPHRYS MONTANA

BY NELSON ANNANDALE, B.A.

IN a note added to Mr. BOULENGER's report on the Batrachia collected by Mr. ROBINSON and myself,¹ I remarked that the structure of the peculiar funnel surrounding the mouth in the tadpole of *Megalophrys montana*, KUHL, a toad belonging to the family Pelobatidae, presented certain features of interest, and I now propose to record my observations on its anatomy and mechanism, making no attempt, for which I have not the materials, to treat it as a developmental entity or to search out its affinities in more or less closely allied forms. It is worthy of note, however, that while the Pelobatidae produce other instances of growths of a similar nature, these growths are merely characteristic of certain species, and that while *Megalophrys montana* has the funnel well developed in the larva, there is no trace of it either in the adult of the same species or in the tadpole of *Leptobrachium basselti*,² Tsch., a form found in the same country under somewhat different conditions. It is not known at what stage in larval or embryonic life the funnel first commences to make its appearance in the former species, and all that I can say regarding its disappearance is, that in the young toad in which the tail is commencing to degenerate it is only represented by a small projection of the integument at the angle of the mouth on each side, whereas in the tadpole whose fore-limbs are just about to pierce the skin it is very nearly, but apparently not quite, as large in proportion to the rest of the body as at a slightly earlier stage of development.

During life, the funnel is capable of assuming two very distinct forms, according to the position of the tadpole³ for the moment:—

(1) When the animal is hanging from the surface film, as it frequently does, this structure becomes a translucent rhomboidal or lozenge-shaped float, depressed in the centre towards the mouth, but otherwise nearly flat.

1. *Antea*, p. 132.

2. Hanitsch, *Rep. Raffles Mus.* Singapore, 1897, p. 8.

3. A very fair representation of the tadpole is given by Dr. Gadow (*Amphibians and Reptiles*, p. 60), but by comparing it with photographs taken from life, I find that the funnel is represented as proportionately too small.

(2) When, on the other hand, the animal is resting on the bottom, the float takes on the appearance of a pair of slender processes, deeply grooved along their upper surface, which represents the anterior surface of the funnel, conjoined at their broadest point over the mouth and curling upwards, like a pair of horns, behind the eyes.

As has been pointed out by Professor MAX WEBER,¹ who first described the tadpole, this change is brought about by muscular action, being due to a folding rather than a contraction of the structure, but Professor WEBER's explanation of its exact mechanism does not appear to me to be correct, and to clear this point from misconception a reconsideration of the structure of the funnel in the light of the sectional method will be necessary. In discussing the funnel it will be convenient to speak of it as having a dorsal and a ventral wall, though these walls, as is readily demonstrated by a transverse section, are really quite continuous; and each wall may be further regarded as having an anterior and a posterior surface, the latter being directed towards the bottom when the tadpole is floating, and the former applied to the surface film under the same conditions.

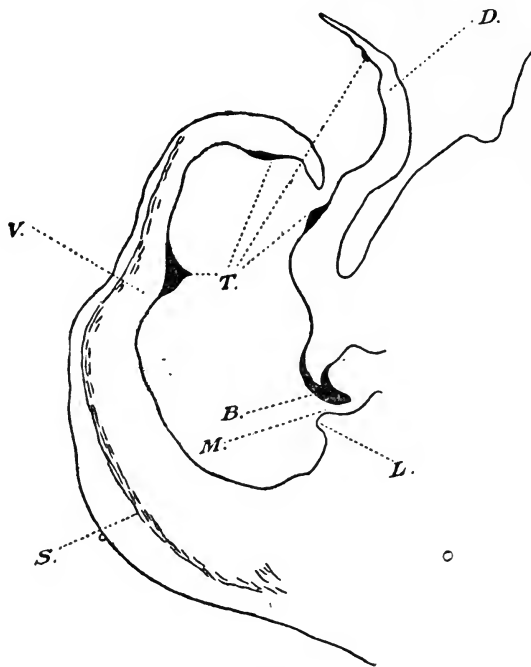


FIG. 1.

Fig. 1 represents the outlines of a median longitudinal section of the funnel in its folded condition, and was obtained from a specimen preserved in $2\frac{1}{2}$ per cent. formol, which was later replaced by alcohol. It will be

1. *Ann. Jard. Bot. Buitenzorg*, 1898, Suppl. ii, pp. 5-10, figs. 1-5.

readily seen that the folding does not merely consist, as Professor WEBER appears to have thought, of an approximation of the two walls to one another, for while the dorsal wall (D) lies back-wards along the dorsal surface of the head for some distance, and then curls upwards and outwards at its free extremity, the ventral wall (V), which is the longer and stouter of the two, runs almost directly upwards at its base, and then curls inwards at its free extremity towards the anterior surface of the dorsal wall. It is evident, therefore, that the folding of the funnel is due, in the first instance, to a bending upwards of the ventral wall, accompanied by a bending backwards of the dorsal wall, and that while the free extremity of the former naturally curls inwards, that of the latter becomes directed at its tip towards the same vertical line from the opposite direction. A very effectual guard to the mouth (M) is thus produced, being further elaborated by the arrangement of the horny teeth (T) situated on the anterior surface of the funnel.

The dorsal wall of the funnel takes its origin in the same relative position as the upper lip of the tadpole of *Rana temporaria*. Inferior to it, a small horny upper jaw or beak (B), the outline of which is somewhat complicated in transverse section, protects the mouth (M), with which I am not concerned; beneath and immediately anterior to it an inconspicuous fleshy ridge (L) possibly represents the lower lip, and the ventral wall of the funnel appears as a hypertrophied structure, which may be produced, in its present condition, either by the growth round the mouth of the upper lip, or, as seems more probable from the mode of disappearance of the funnel, by a general alteration of the tissues in this region. The lower jaw, which is very large, is doubled backwards behind the beak, and is not included in the field of the figure, in which the posterior half of the upper jaw is also omitted.

Under a high power it is seen that the bulk of both walls consists of a vacuolated central mass, in which it is not possible to distinguish cell walls, though nuclei are abundant. The spaces in this central mass are true vacuoles, surrounded by anastomosing threads of protoplasm and devoid of blood corpuscles; in life, they appear to be filled with a colourless, amorphous jelly, which can be expressed from the funnel if it is violently squeezed.

Running in the central mass, accompanied by minute capillaries, are a number of slender strands of striped muscular tissue, which radiate outwards towards the periphery of the funnel. Professor WEBER¹ figures their course as it is seen from above, but represents their ramifications as longer and more complicated than my sections would seem to indicate. They are more richly distributed in the ventral wall than in the dorsal, and, so far as I have been able to

1. *Loc. cit.*

trace them, they originate from seven main branches, which all arise in a semi-circle below the mouth. The course of one of the strands is indicated in fig. 1, but it is not sketched direct from any one section, as it does not lie exactly, but only approximately, in the plane of the middle line. It runs, as will be observed, towards the posterior surface of the wall, and this seems always to be the case with the strands in both walls. Professor WEBER states that contraction of these muscles causes the walls of the funnel to be drawn together, but, in my opinion, they have exactly the opposite function. Observations on the living tadpole have convinced me that the folded condition of the funnel is the condition of rest, and that its unfolding is due to a muscular effort, and I think it is evident that if the muscles have the course I have indicated, their contraction will cause the basal part of the funnel to become rigid, and therefore to unfold itself, while the free extremity is probably flaccid under all conditions, being forced to straighten itself by external pressure as the tadpole rises to the surface.

The epithelium which bounds the central mass is continuous with that of the general surface of the body, from which it differs in the absence of pigment granules and in its tendency, above, to form horny structures. It consists of small cells, five or six layers deep and generally approaching a quadrangular form; their walls are well defined, their nuclei small. So far as I have been able to discover, there is no limiting membrane on the surface of the funnel. Blood vessels and blood sinuses do not occur in the epithelium, but it is possible to catch glimpses of minute branching nerves, which probably terminate, though I have not been able to trace them, in large, flask-shaped cells scattered singly on the surface. The latter are probably sensory in function, as their contents are not granular; they have no connexion with the horny teeth.

The structure and arrangement of these horny teeth differ considerably from those of the teeth of *Pelobates fuscus*,¹ as well as the teeth of the Ranidae,² for they are not connected in any way with definite ridges or depressions, but radiate out along the anterior surface of the funnel, and they are not, even in a limited sense, unicellular. They arise, however, in the epithelium, appearing on the surface as minute, conical, non-serrated horny bodies, beneath which the epithelium is distinctly arched over a corresponding prominence of the central mass. In what appear to be young teeth, a group of cells, lying immediately over the central mass, can be distinguished by their thickened walls. Higher, the walls have become definitely cornified,

1. E. Gutzeit, *Zeitschr. wiss. Zool.*, vol. XLIX, 1889, p. 50, pl. II, figs. 30-32.

2. *Ibid.*, p. 46, and E. Schulze, *Abhandl. Konigl. Preuss. Akad.* 1888.

and, higher still, the cell contents are invaded by anastomosing filaments of horn, which originate in the now completely horny walls. These filaments grow thicker and more complicated, until, finally, the protoplasm is completely obliterated, and the cell limits disappear in a uniform horny mass, the conical outline of which is regulated by the fact that a greater number of cells is infected by the corniferous stimulus or material in the deeper layers of the epithelium than on the surface. A continuous growth from below takes place, so that the tooth, as it is worn away on the surface, is supplied, gradually and without break, with fresh substance. The process of growth can be observed very clearly in a series of longitudinal sections of the same individual, but in the material at my disposal the teeth are all more or less fully developed, and their exact origin cannot, therefore, be ascertained.

The action and movements of the funnel have already been noted in brief, but we are now in a position to discuss them a little more fully. In the first place, the absence of vascular tissue of blood vessels, except for the capillaries which accompany the muscles, proves that it is not, in the ordinary sense, an accessory breathing apparatus; but possibly it may be connected indirectly with the oxygenation of the blood. On three separate occasions I have taken the larvae of *Megalophrys montana* in a small muddy pool, which was liable, on the one hand, to dry up altogether, and, on the other, to become part of a rapid torrent, generated by a single heavy shower; and it is obvious that in such a torrent an animal which can float lightly on the surface, as the tadpole does with its funnel, will be in a very much better position to obtain oxygen than one which is being hurried along among the mud and debris near the bottom. The tadpole of *Rana larutensis*,¹ BLGR., which also inhabits mountain streams in the Malay Peninsula, and those of several other species, are provided for the same emergency in a different way, bearing on their belly a large sucker, which prevents them from being washed away at all and allows them to cling to the rocks of the most rapid torrent. The tadpoles of *Leptobrachium basseltii*, on the other hand, have no special need for any apparatus of the kind, for they are found, so far as my own experience of them goes, in deep pools at the edge of streams in level country, and they only rise to the surface occasionally. The main function of the funnel, then, is to act as a float, and, very probably, to protect the mouth of the tadpole from the entry of noxious organisms when it is burrowing in the mud, as drought causes it to do. It is possible also that it assists in the capture of the minute plants and animals on which the species feeds, though I can give no direct evidence for this function. If the tadpole

1. Laidlaw, P.Z.S., LXXXVIII, 1900, p. 886, pl. LVII, figs. 3, 4.

is watched when it is hanging from the surface film, it will be remarked that the float is constantly expanding and contracting, owing to the respiratory movements of the mouth, and that, although the movements are too gentle to overcome the friction produced by the body and tail, which hang more or less vertically downwards in the water, and so to cause the animal to progress in one direction or another, they produce distinct currents on the surface, which bring towards the mouth any minute particle which may chance to be floating in its vicinity. Every now and then, without apparent cause, the tadpole sinks, and lies resting on the bottom for some little time before re-ascending to the surface. Photographs, which I was so fortunate as to obtain, show that the surface film is perceptibly raised over the whole area of the float, owing to upward pressure of the body, and when the tadpole sinks a regular vortex is caused, down which floating particles are hurried. At the moment of sinking the animal permits the funnel to fold itself, indeed, it is this action which causes it to sink, and it is quite conceivable that some of these particles may be enclosed in the folded funnel and so conveyed to the mouth; a glance at Fig. 1 will show how difficult it would be for them to escape, were they once properly engulfed.

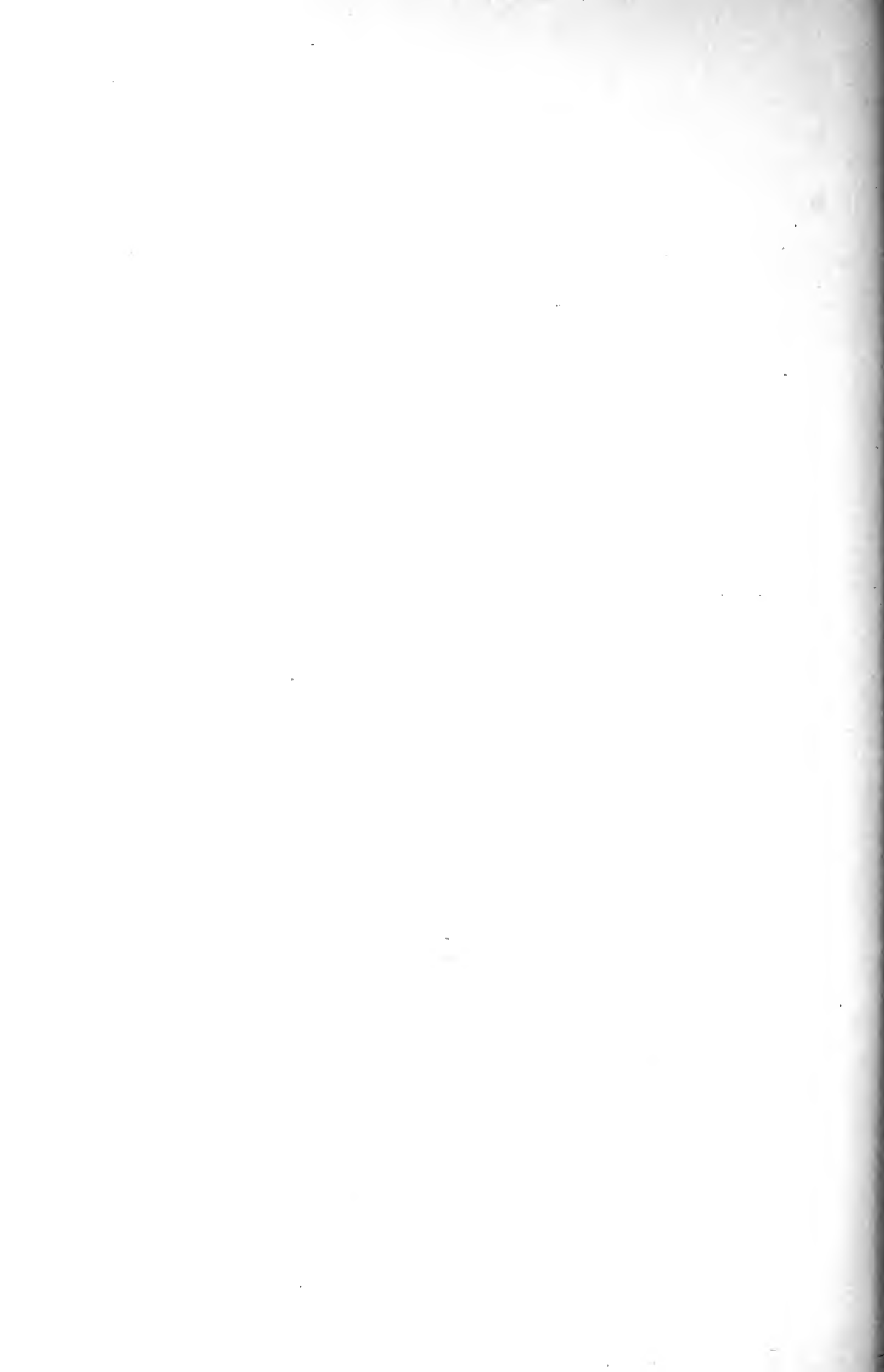
The function of the horny teeth is a difficult question, for their divergence in structure from the type apparently normal in frogs and toads shows clearly that they are not mere vestigial structures. Dr. GADOW¹ suggests that they are used for rasping the under surface of the leaves of water plants, but I am obliged to disagree with this suggestion for the following reasons:—(1) The habitat of the tadpoles is not one suitable for the growth of water plants; (2) I have never seen the funnel unfolded completely except when it was in contact with the surface film, and, although the under surface of floating leaves might well take the place of the surface film, I do not think that the muscles would permit a rasping action, for which the plain conical teeth would be far less efficacious than if they were serrated in the typical manner, and (3) the food of the species, judging from the contents of the alimentary canal in several specimens, does not consist of rasped leaves. I cannot offer any observations on the exact function of the structures, but I would suggest that one or more of three functions are possible:—(1) They may serve to strengthen the funnel when it is in use as a float, (2) they may increase its surface area and so make it more powerful, or (3) they may serve as additional factors in the retention of nutritious particles within the funnel, and in preventing the entry of harmful organisms or substances.

It only remains for me to express my thanks to Professor J. COSSAR EWART for the use of his laboratory in working at the material upon which this paper is mainly based.

1. *Loc. cit.*

HELIOCOPRIS MOUHOTUS AND DOMINUS

By D. SHARP, M.A., F.R.S.



INTRODUCTORY NOTE

THE great majority of the specimens on which Dr. SHARP comments in the present paper, were obtained during a few days in October, 1901, at Biserat. On other occasions single specimens, or, more often, a male and a female together, were brought us by natives, who said that they had found them on elephant dung. The cause of their abundance at Biserat, during the few days mentioned, appeared to be that a large train of elephants, in whose droppings they were taken, had just come to the village.

I was not quite right in stating in a former paper¹ that only the male of *Helicopris mouhotus* can stridulate, for I find that the female is also able to emit a sound, though less readily. The bat-like squeak appears to be produced by the action of the legs in their sockets—I think only the intermediate pair—and can be brought about in specimens lately killed by moving the legs and at the same time pressing them in towards their base.

NELSON ANNANDALE

1. P.Z.S., 1900, p. 862.



HELIOCOPRIS MOUHOTUS AND DOMINUS

By D. SHARP, M.A., F.R.S.

CAMBRIDGE, NOVEMBER 12, 1903

THESE two forms of Copridae are amongst the largest of insects, and yet very little is known about them. In consequence of this, and also, perhaps, of a mistake made by the late Signor FEA, the idea has arisen that the two names are merely synonyms. Although this is not the case, it is probable that the two are really one species, for though it is not quite certain, I think it highly probable that *H. mouhotus* is a discontinuous variety of *H. dominus* which is only produced in certain localities and under certain conditions.¹

The following are the chief points that have been ascertained. In 1868, the late H. W. BATES described² *Heliocopris domina* from Assam. He distinguishes two forms; a large male having four horns or prominences on the head, and a smaller male differing chiefly in having the horns of a smaller size and the sexual protuberance of the thorax smaller. The female was not known to BATES.

In 1878, I described *Heliocopris mouhotus* from Cochin China.³ In this case I had three forms before me; a large form of the male having two horns on the head, and a great sexual protuberance on the thorax; a smaller male destitute of the two large horns, but having a transverse central elevation on the head, the extremity on either side being prolonged and acute; the female was described as possessing the structure of the head usual in that sex in the genus.

In 1897, the late Signor FEA figured the large male of *H. mouhotus*, calling it, however, *H. dominus*, BATES.⁴ Since then little has been written about these insects, but I have received letters enquiring whether *H. dominus* and *H. mouhotus* are the same thing or not.

1. The French biologists object to the term 'discontinuous' and prefer 'abrupt' ('*brusque*'), and I think are right in this.

2. *Col. Hefte* IV, p. 88.

3. *Ent. Mo. Mag.* XV, p. 155.

4. Fea, *Viaggio Zool. in Birmania*, p. 168.

MESSRS. ANNANDALE and ROBINSON have now brought from the Malay Peninsula a series of twenty-four individuals of *Heliocopriss*, which, after repeated examination, I believe to be all one species, and the one I described as *H. mouhotus*. There are eight females, three large males agreeing with the large male of *H. moubotus* (as previously known), in addition to three other males¹ which agree sufficiently well with the male type of *H. dominus*, BATES, to make me feel doubtful whether they are distinct therefrom.

By the kindness of my friend, M. RENE OBERTHUR, of Rennes, I have also before me eleven other specimens of these forms from Siam, Upper Burma, Rungpore, and Trichinopoly. They include the types of *H. dominus* and *H. moubotus*, and, on the whole, confirm the opinion I am now putting forward, that the two are really only one species.

There is, however, one point of considerable interest to which I must call attention, viz., that there are no specimens intermediate between the two-horned large form (fig. A) I called *H. moubotus*, and the four-horned large male, BATES called *H. domina* (fig. B). If, therefore, I am correct in considering all the forms to be one species, it would appear that the form A is a very remarkable case of abrupt variation. It is, indeed, difficult to see how there could be a form intermediate between the A and B of our figures. C is clearly only a diminished or depauperated form of B. But B could only be made into A by pushing the two middle horns apart from one another, so that each became joined to the lateral horn on the same side, thus making two thick horns instead of four smaller ones.

I imagine that something of this kind really happens in the course of the ontogeny of the large two-horned individuals, and if so, it is clear that not only have we at present no intermediate between the two forms, but also that we are not likely to find such, except as teratological specimens in which the coalescence of the horns is arrested before it is completed.

I may remark that we know nothing as to the Natural History of these large forms, though I am informed by Mr. ANNANDALE that they frequent the dung of elephants.

The localities for the specimens of MESSRS. ANNANDALE and ROBINSON are both near Patani, viz. :—

Ban Sai Kau, Nawngchik. May, 1901.

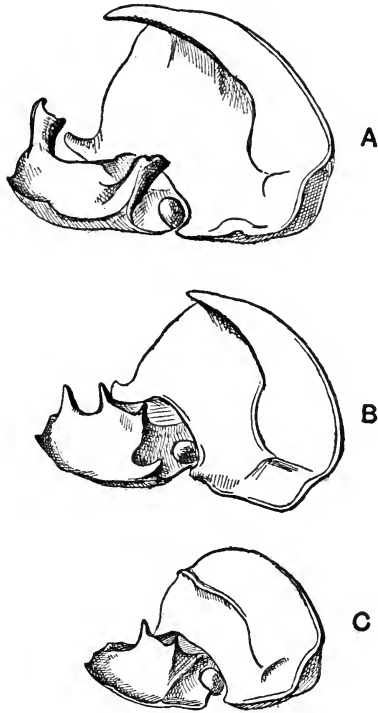
Biserat, Jalor. October, 1901.

I may add that I have hesitated much about coming to a decision in this question, and that the evidence as to the conspecificity of *H. dominus* and *moubotus* is not quite convincing, because of the fact that few individuals of

1. The other ten males are of less perfect development, and do not contribute any important evidence.

H. dominus are extant in collections. M. RENE OBERTHUR is of opinion that *H. mouhotus* and *H. dominus* may prove to be distinct species. If so, we have a case that as regards variation is very remarkable; because the females, small males, and moderate males of the two forms (or species) are very much alike, while the large males of the two are not similar. M. OBERTHUR has specimens that he considers to be *H. dominus* from Assam, Upper Burma, Rungpore, and Trichinopoly, these being some of the examples I have previously mentioned. This suggests a different distribution for the two forms, *H. dominus* occurring on the continent of India, and *H. mouhotus* in Cochinchina, Siam, and the Malay States. If this difference in distribution should prove to be real (and not due merely to the small number of specimens that have been collected), it will be strong evidence in support of the distinctness of the two forms. Perhaps the life-histories may elucidate the question, but as to this very little is, I believe, known.

If it should prove that there are two species, the evidence goes to show that the abrupt variety that I have described in *H. mouhotus* does not occur in *H. dominus*.



Heliocopris mouhotus ♂ Scale: $\frac{1}{1}$

A = major-form. B = minor form. C = third form.



MARINE FISHES

BY J. JOHNSTONE, B.Sc.



INTRODUCTORY NOTE

IN introducing the present paper it should be explained that, with the exception of the *Gobiidae*, which are of considerable bionomic interest, we made no serious attempt to collect marine fish at Patani or elsewhere. The few that we sent home are either of ethnographical importance or were purchased casually in the market or from fishermen, to fill up space in a vessel containing other specimens. Fishing is the principal industry of Patani, and the bay should prove an excellent collecting ground for shallow-water forms ; the number that could be obtained with a little trouble would certainly be very large. Fishing is carried on mainly in three ways :—by means of large shrimping-nets, worked either by one man or by two, in water not more than four feet deep ; by long drift-nets, which are laid some distance out to sea, where there is as much as thirty fathoms of water ; and by seines, sometimes as much as two or three hundred fathoms long, which are used both on the seaward beach of Cape Patani, where there is an evenly sloping bottom of hard sand, and from little boats in the bay, where the bottom is muddy and the nets are shorter. The marine gobies in our collection were either shot with a collector's gun or caught for us by little boys, while the other specimens came mostly from the seines or the drift-nets.

HERBERT C. ROBINSON



REPORT ON THE MARINE FISHES

By J. JOHNSTONE, B.Sc.

THE marine fish collected by Messrs. ANNANDALE and ROBINSON on the coast of Patani and Jhering, belong to the following species :—

SQUAMIPINNES

1. *Chaetodon* (?) sp.

I refer to this family three small fishes, 1 cm. and less in length, which were caught on the surface in the estuary of the Jambu River.

They are oblong and compressed, and the head is heavily armed with bone. There is a long and stout post-frontal spine, and another smaller spine at the inferior angle of the operculum. The skin is apparently scaleless, but is covered with minute spines. The dorsal fin has eleven spines, followed by eighteen rays; the anal has four stout and pointed spines and sixteen rays. The fish resembles *Tbolichthys*,¹ but is certainly a different form. It is probably the young of a species of *Chaetodon*.

‘Little fish similar to the above are not uncommon in the Jambu estuary, generally swimming near the surface in companies of three or four.’

SCORPAENIDAE

2. *Scorpaenopsis oxycephala*, (Blkr.)

Scorpaena oxycephalus, *Blkr., Sclerop.*, p. 20.

‘Probably from sunk rocks outside Patani bay.’

SCIAENIDAE

3. *Sciaena belengeri*, (C. and V.)

Corvina belengeri, *Cuv. and Val.*, v, p. 120.

4. *Sciaena glaucus*, Day

Sciaena glaucus, *Day, Fishes India*, p. 192, pl. xlvi, fig. 2.

5. *Otolithus maculatus*, Cuv.

Otolithus maculatus, *Cuv., Régn. Anim. Poiss.*, vol. xxvii, fig. 2.

1. Günther, *Ann. Mag. Nat. Hist.*, 1868, p. 457.

TRICHIURIDAE

6. *Trichiurus savala*, C. and V.

Trichiurus savala, *Cuv. and Val.*, viii, p. 251, pl. 244.

7. *Trichiurus haumela*, (Forsk.)

Clupea haumela, *Forsk.*, p. 72.

'These two species are known at Patani as *Ikan lelayang*,¹ and form the object of a cult among certain Malay families.²

GARANGIDAE

8. *Caranx nigripinnis*, Day

Caranx nigripinnis, *Day, Fishes India*, p. 225, pl. li, fig. 5.

9. *Chorinemus moadetta*, C. and V.

Chorinemus moadetta, *Cuv. and Val.*, viii, p. 382.

One specimen obtained differs, in some respects, from DAY's description.³ The spines of the first dorsal fin are slightly flattened and overlap each other. The first is recumbent and directed forward; it is very small and almost concealed by the skin. There are seven free spines in addition to this concealed one. The second dorsal fin has one spine and twenty rays, and the anal has two spines and twenty rays. The height of the body is contained four-and-a-quarter times in the total length. The skin is thick and leathery; the scales are very small and are invisible even to a hand lens; they lie in longitudinal rows with their ends overlapping. Their longitudinal diameter is ten times that of the transverse. They are blunt at one end and pointed at the other.

One specimen, four inches long.

10. *Equila ruconius*, (Ham. Buch.)

Chanda ruconius, *Ham. Buch. Fish. Ganges*, pp. 106, 371, pl. xii, fig. 35.

'Very numerous. The individuals of this species swim in shoals of about thirty or forty, being very common in the brackish water of the Jambu and Patani estuaries. They are continually leaping from the surface together, and cause brilliant flashes of luminescence by their movements at night. The fishermen catch them in order that they may form an ingredient of *blacham*—a malodorous Malay relish made of all kinds of small fish and crustaceans, pounded up, half cured in weak brine, and allowed to become putrid.'

1. The word *lelayang* in the Patani dialect = *layang-layang* (swallow, swift, or toy kite) in more correct Malay, just as *lelagu* (*antea*, part I, p. 147, note) = *lagu-lagu*, and *kakachang* (*postea*, fish, no. 19) = *kachang-kachang* (peas or lentils). N.A.

2. *Fascic. Malay.—Anthropology*, part I, pp. 74-76.

3. *Day, Fishes India*, p. 230, pl. liii, fig. 1.

11. *Lactarius delicatulus*, C. and V.

Lactarius delicatulus, *Cuv. and Val.*, ix, p. 238, pl. 261.

'The *Ikan lemak* (fat fish) of the Patani fishermen ; also the centre of a family cult.'

SCOMBERIDAE**12. *Scomber brachysoma*, Blkr.**

Scomber brachysoma, *Blkr. Makr.*, p. 236.

TRACHINIDAE**13. *Silago sihama* (Forsk)**

Atherina Sihama, *Forsk.*, p. 70.

GOBIIDAE**14. *Apocryptes lanceolatus*, (Blkr. Schn.)**

Eleotris lanceolata, *Blkr. Schn.*, p. 67, fig. 15.

Two specimens from the Janbu estuary.

'This is the least terrestrial of the mud gobies which we saw in Malaya, and is obviously less highly specialized for an amphibious life than any species of *Boleophthalmus* or *Periophthalmus* ; but it frequently wriggles along the mud some yards away from the water, and its powers of "walking," or rather hopping, on land, though less well-developed than those of its allies, are by no means absent. At the mouth of the Patani River, at dead low tide, numerous individuals line the water's edge, and by some muscular effort raise their heads and bodies into the air almost vertically, remaining poised, as if standing upright on their tails for an instant, and then falling prone on the liquid mud. This curious manoeuvre, probably executed in attempts to capture flies, causes a peculiar sound, which can be heard all along the shore.'

15. *Periophthalmus koelreuteri* (Pall.)

Gobius koelreuteri *Pall.*, *Spic.* vii, p. 8, vol. 2, fig. 1.

Eight specimens, one-and-a-half inches to three inches long.

First dorsal = 10-14 ; second dorsal = 13-14 ; anal = 11. Pelvic fins in every specimen completely separate.

'*P. koelreuteri*, at any rate in youth, appears to prefer mud of a rather firmer consistency than that affected by *P. phya*, and to enjoy climbing on roots and stones, the difference in its habits rendering it comparatively easy

of capture. We can neither confirm nor disagree with Professor HICKSON'S view, that this species sits with its tail in the water, oxygenating its blood by means of the highly vascular tissues of this organ, and we have no reason to think that it constructs a burrow or nest ; but it must be remembered that all the individuals of this species which we observed were probably immature. The young are common, together with those of the succeeding species and of several of *Boleophthalmus*, a mile-and-a-half up the Patani River from the sea, in brackish water among the roots of sago and nipa palms, and it is probable, judging from the analogy of other forms, that they go further up stream than the adults. The eyes did not seem to us to be so prominent in life as those of specimens of *P. koelreuteri* from West Africa, which we have seen in the aquarium of the Free Public Museums in Liverpool and the gardens of the Zoological Society of London.

16. *Periophthalmus phya*¹, sp. nov.

(Pl. XIV)

This form resembles *P. schlosseri*, but appears to differ in (1) the complete fusion of the pelvic fins in both young and adult specimens ; (2) the number of rays in the pectoral fins ; (3) the number of rays in the caudal fins, and (4) the larger size of the specimens obtained.

The length of the head is contained four times, and the height of the body five and two-thirds times, in the extreme length. The cleft of the mouth is continued back to about the middle of the orbit ; the upper jaw projects slightly ; the snout has a very prominent fleshy fold, at either extremity of which are situated flattened, pointed, nasal tentacles with the nostrils at their extremities. In the upper jaw there are three or four large pointed and slightly curved teeth on either side of the symphysis, with eight or nine much smaller conical ones at each side in a single row. In the lower jaw there are ten to fourteen teeth on each side, smaller than those at the centre of the upper jaw, and becoming smaller posteriorly ; all the teeth in the lower jaw are vertical. Teeth are frequently wanting close to the mandibular symphysis. The upper and lower lips are covered with small, low papillae or tubercles.

The first dorsal fin contains from seven to nine flexible spines, the first of which is the longest, and is about half the length of the head ; the second dorsal has thirteen to fourteen rays, and the anal twelve to thirteen rays ; the pectoral has seventeen to eighteen, and the caudal eighteen to nineteen rays. These numbers represent the extreme variability in nine large individuals, from ten to twelve inches in total length. The pelvic fins are fused throughout their entire length in all these specimens.

¹*Phya* is a high Siamese title.—Edd.

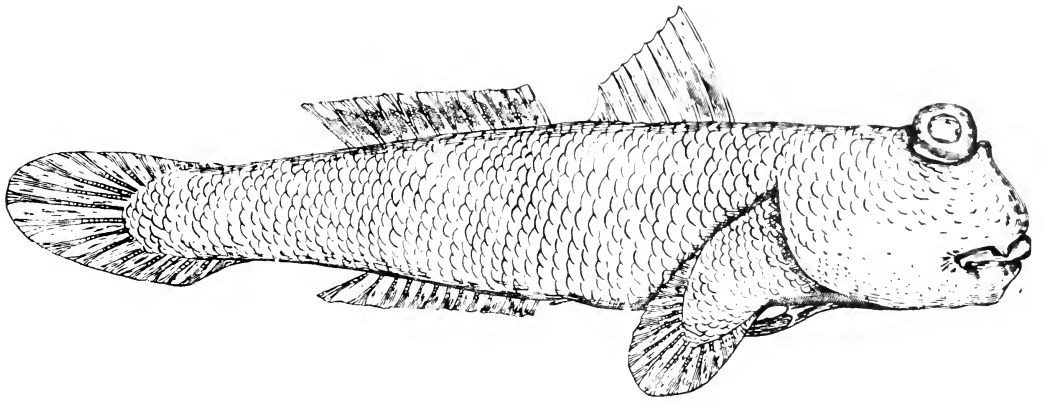


Fig. 1. PERIOPHTHALMUS PHYA, SP. NOV. Scale, $\frac{1}{2}$.



Fig. 2. BURROW, showing rampart of mud pellets.



Fig. 3. BURROW, with tracks of pectoral fins.



Fig. 4. BURROW, after obliteration of rampart by tide.



The scales are indistinct on the head in front of the eyes; they are distinctly visible on the rest of the body. The lateral line is indistinct, but there are fifty-five to fifty-eight scales in a longitudinal row from the upper base of the pectoral fin to the tail. There are about fifteen scales in a transverse row at the beginning of the first dorsal fin.

About half-a-dozen smaller specimens of this form were obtained, varying from four-and-a-quarter to six-and-a-half inches in length. In all these the fin formula is similar to that of the larger specimens, except that the number of rays in the caudal fin is greater (nineteen to twenty-two). The pelvic fins are completely fused in every instance.

Three still smaller specimens I also include in this species. They are from two to two-and-one-eighth inches in total length; the length of the head is contained four-and-a-half times, and the height of the body six-and-one-third times, in the extreme length. The fin formulae are:—

$$D = 6/12-14; A = 13-14; P = 16; C = 25-29.$$

The pelvic fins are completely fused in these specimens also. There are forty-five to fifty scales in a longitudinal row. There are three large curved teeth on either side in the upper jaw near the symphysis, with fifteen to eighteen smaller ones in a single row. The lower jaw contains four caniniform teeth on each side of the symphysis, and seven to eight smaller ones directed vertically.

'*Periophthalmus phya*, at any rate in the adult state, has a more sober coloration in life than several of its allies, which are conspicuously dotted with pale blue spots, for it is of an almost uniform dark fuscous shade. Its head and body are covered with a very thick layer of mucus, which probably prevents the too rapid evaporation of moisture from its tissues—an important matter in so large an amphibious fish.

Very probably the species occurs in the West Coast estuaries of the Peninsula, for burrows similar to the ones it forms are common on the mud flats at Port Swettenham, in Selangor. The adults are very abundant in the immediate vicinity of the town of Jambu, where a large area of semi-liquid mud is exposed at low tide, but their wariness renders them difficult of approach, especially at half-tide, when they do not appear to have settled down to a terrestrial existence. They seem to be very sensitive to cold or fog, and do not come out on the mud-flats early in the morning, even at low tide. When the sun is well up, however, they skip about many yards away from any water, and quite careless as to whether their tail or any other part of their body can be kept wet, even when the temperature is so high that sand becomes too hot for a European to walk upon it with bare feet.'

RADIAL FORMULÆ OF *Periophthalmus phya*

Extreme length	Spinous dorsal	Soft dorsal	Anal	Pectoral	Caudal
10 inches to 11½ inches	8	13	13	17	17
	8	13	13	17	19
	8	13	13	17	19
	7	13	13	17	21
	8	13	13	17	21
	9	13	13	16	20
	8	13	13	16	20
9½ inches	8	13	13	17	19
9½ inches	8	13	13	17	20
6¾ inches	8	13	13	17	23
6¼ inches	8	12	12	17	22
5¾ inches	7	13	13	17	21
4½ inches	8	13	13	17	23
2 inches	6	14	14	16	29
to	6	12	13	16	25
2⅛ inches	6	Injured	14	16	28

In all these specimens the pelvic fins are completely fused.

Localities—Estuaries of Jambu and Patani Rivers.

‘ A most important feature in which the habits of the present form differ from those of its congeners is that it constructs a more or less permanent burrow, in which it takes refuge when alarmed and remains in bad weather. Whether this burrow is also used as a nest we cannot be sure, but it appears to be frequented by individuals of both sexes, and the natives say that the female deposits her eggs in smaller holes made for the purpose. The main entrance to the large burrows (Pl. XIV) is always more or less funnel-shaped and

slanting, and lies in an oval or circular pool of water, which is retained round it as the tide sinks—for it is always made between tide-marks—by a rampart of mud some four to six inches in height, and about a foot-and-a-half in diameter. It is surrounded, outside the rampart, by a number of simple holes, which probably lead into the central shaft, though, owing to the liquid condition of the mud, we were unable to demonstrate this by digging. When thoroughly alarmed, the fish sometimes enters one of these holes, but if only a little scared, it rushes to the rampart, surmounts it, and sits for a longer or shorter period on it before diving into the pool and disappearing. It seemed quite evident to us that each individual had its proper burrow, but how many inhabited one burrow we could not ascertain ; it appeared that their number must be small. The central pool was always entered at one point, so that a definite furrow was made on the rampart, and the characteristic tracks of the fish—consisting of a central line (made by the tail) and two series, running parallel to one another on either side of the line, of more or less hand-shaped depressions (made by the tips of the more prominent pelvic rays and the web between them)—converged towards it, showing readily whether the fish had recently gone out or in.

At first we were much puzzled as to how the rampart and burrow were made, but the natives told us that the fish wriggled down into the mud, filled its mouth with the stiffer clay beneath the surface, and built up the wall with pellets thus brought from below. We found it impossible to confirm their statement by actual observation, but there is every reason, in this case, to regard them as accurate observers, for the colour of the walls plainly showed that they were not made of surface mud, while the shape and size of the pellets, which could easily be distinguished in freshly constructed specimens, were just what would have been expected had they been casts of the inside of the mouth of an adult of *P. phya* ; nor did we ever see a small specimen enter one of the burrows. One of us watched a large individual repairing its rampart, which had been injured by the tide, for some time, but could not be sure exactly how this was accomplished ; the fish certainly went down the central hole and returned in a few seconds, bringing a pellet of mud with it.

The eyesight of this species appears to be keen, both in air and water, and to range in the former element for a radius of at least thirty feet. We noticed repeatedly that when we had frightened an individual into its burrow, it remained concealed as long as we stayed still, but reappeared as soon as we began to move away ; and this would seem to indicate that the fish could see from beneath the surface of the water what was going on in the air. On

land, at any rate, it is absolutely deaf, and ROBINSON found, when shooting specimens, that those which were not hit took no notice whatsoever of the report of the gun, and only moved when the shot spattered them with mud.'

17. *Boleophthalmus viridis* (Ham. Buch.)

Gobius viridis, *Ham. Buch., Fish. Ganges*, pp. 42-366, pl. 32, fig. 12.

$$D = 5/26 ; A = 26.$$

One large barbel under the symphysis of the lower jaw, and a row of five much smaller ones on each mandibular ramus; four to six barbels on the upper lip.

Two specimens, about four inches long.

18. *Boleophthalmus pectinirostris* (Gmel. Lim.)

Gobius pectinorostris, *Gmel., Linn. i*, p. 200.

The third spine of the first dorsal fin is the longest; its length is twice the height of the body at the origin of the spinous dorsal fin. The other spines of the first dorsal have also filamentous extremities. There are six oblique dark bands (in spirit) on the body behind the origin of the first dorsal fin.

One specimen, seven inches in total length.

19. *Boleophthalmus boddaerti* (Pall.)

Gobius boddaerti, *Pall., Spic. viii*, p. 11, pl. 2, figs. 4-5.

A number of specimens from two-and-a-half to seven inches in total length; one specimen with four spines in the first dorsal fin.

'The species of this genus do not differ from one another to any great extent in habits. The present form, which is the commonest at Jambu, hops about, like *P. pbya*, in the hottest sunshine, and appears to make a permanent burrow, which, however, is of a very simple nature, devoid of a surrounding rampart. When alarmed it frequently wriggles, tail foremost, into the mud, and this would seem to be the way in which its holes are commenced. Its food, and probably that of *P. pbya*, is largely of a vegetable nature, and we have watched it browsing on a minute green alga that closely covers the surface of the mud-flats at certain points. Unlike *P. pbya*, it carries its dorsal fin rays elevated in the air. This gives it a very distinctive appearance as the web of the fin is dotted with conspicuous blue spots. Possibly the fin aids it in its terrestrial progress, like the sail of an ice-boat, as the rays are lowered so as to lie prone whenever it passes through a pool of water even too shallow to wet its dorsal surface; in such conditions a sail might cause

it to topple over. The adults are very pugnacious, and if two individuals happen to meet face to face, a hostile demonstration always takes place; they rush together, raising and depressing their dorsal fins with great rapidity, but do not appear to injure one another in any way, and soon part and continue their course.

The chief vertebrate enemies of the "walking" fish in the Patani States are fishing hawks, monitor lizards,¹ and possibly others.'

The Malays call the fish of this and the preceding genus *Ikan timbakul*—a name of very doubtful significance, as the native story² which attempts to connect it with *bakul* (a basket) is obviously invented to explain the name, which has probably no connexion with *timbangau* (tobacco) either. At Patani the flesh of these fish is sometimes eaten raw, being considered a powerful tonic or aphrodisiac, probably on account of their extraordinary vigour in an element so uncongenial to their class. N.A.

SPHYRAENIDAE

20. *Sphyraena jello*, C. and V.

Sphyraena jello, *Cuv. and Val.*, iii, p. 349.

One specimen from Patani.

'The *Ikan kakachang* (lentil fish) of the Patani fishermen; formerly the object of a family cult³ at Patani (originally, it is said, on the coast of Kelantan), and still revered by certain families at Tanjong Budi.'

PLEURONECTIDAE

21. *Cynoglossus macrolepidotus* (Blkr.)

Plagusia macrolepidotus, *Blkr.*, *Pleuron*, p. 25.

'This is the *Ikan sa-blab* (half, or split fish) of the Patani Malays, but the name is probably applied to different flat fish in different parts of the Peninsula.'

SILURIDAE

22. *Plotosus canius*, Ham. Buch.

Plotosus canius, *Ham. Buch.*, *Fish. Ganges*, pp. 142, 347, pl. xv, fig. 44.

One specimen, one-and-a-half inches long.

'Young of the *ikan sembilab*. The spines of this fish—probably several species of Silurids are included in the Malay name—are said to be very poisonous, causing great pain and swelling, and occasionally even death, to human beings scratched by them when wading.'

1. *Antea*, p. 157.

2. *Fascic. Malay.—Anthropology*, part I, pp. 177, 178.

3. " " " " pp. 74-76.

CLUPEIDAE**23. Opisthopterus tartoor**, Russell.

Opisthopterus tartoor, *Russell, Fish. Vizag.* ii, p. 74, pl. 193.

24. Pellona brachysoma, Blkr.

Pellona brachysoma, *Blkr., Verb. Bat. Gen.* xxiv, *Haring*, p. 82.

SCLERODERMI**25. Triacanthus brevirostris**, Temm. and Schleg.

Triacanthus brevirostris, *Temm. and Schleg., Fauna Japon. Poiss.* p. 294 tab. 129, fig. 2.

GYMNODONTES**26. Tetrodon fluviatilis**, Ham. Buch.

Tetrodon fluviatilis, *Ham. Buch., Fish. Ganges*, pp. 6, 362, pl. xxx, fig. 1.

‘Common in Patani bay and in the neighbouring rivers. The *ikan bantal* (pillow fish) of the Malays. It is said to be very vicious and to bite people in the water.’

PRISTIDAE**27. Pristis cuspidatus**, Latham.

Pristis cuspidatus, *Latham, Trans. Linn. Soc.*, 1794, ii, p. 279, pl. 26.

Young specimen, Patani bay.

‘Young specimens are common enough in this bay and on the seaward shore of Cape Patani.’

RHINOBATIDAE**28. Rhinobatus granulatus** (Blkr. Schn.)

Rhinobatus granulatus, *Cuv., Règn. Anim.* p. 353.

‘Common in Patani bay.’

SCYLLIDAE**29. Chiloscyllium indicum** (Gmel. Linn.)

Squalus indicus, *Gmel. Linn.*, i, p. 1503.

‘*Ikan yu bodob* (stupid shark); said to be so named because it can be captured by a process analogous to “tickling” trout. Young specimens are common in Patani bay.’

CARCHARIDAE**30. Zygaena blochii**, Cuv.

Zygaena blochii, *Cuv., Règn. Anim.*

Two specimens, about twelve inches long, from Patani bay.

‘The centre of a family cult in Malacca.’

LIST OF FRESHWATER FISHES

BY G. A. BOULENGER, F.R.S.

'WITH the exception of *Barbus obtusirostris*, the following fishes are from the Patani watershed. One *Barbus* and *Clarias magur* were taken in a jungle stream on Bukit Besar, at an altitude of 2,000 to 2,500 feet; the remainder were caught in the Patani River between Biserat and Patani town.'

CYPRINIDAE

1. **Barbus obtusirostris**, C. and V.
Telôm stream,¹ Perak-Pahang boundary. 4,000 feet.
2. **Barbus douronensis**, C. and V.
3. **Barbus deauratus**, C. and V.
4. **Osteochilus waandersii**, Blkr.
5. **Dangila cuvieri**, C. and V.
Also in Patani bay.
6. **Acanthopsis choerorhynchus**, Blkr.

SILURIDAE

7. **Bagarius yarrellii**, Sykes
8. **Clarias magur**, Ham. Buch.

SYMBRANCHIDAE

9. **Symbranchus bengalensis**, McClell.

NANDIDAE

10. **Catopra fasciata**, Blkr.

OSPHROMENIDAE

11. **Osphromenus olfax**, Comm.

GOBIIDAE

12. **Gobius giuris**, Ham. Buch.

1. This stream is part of the system which ultimately reaches the sea by the Pahang River, so that fish from it may be regarded as belonging to the East Coast Fauna just as much as those from Biserat.—EDD.



ELEPHAS NAMADICUS

By CHARLES W. ANDREWS, D.Sc.



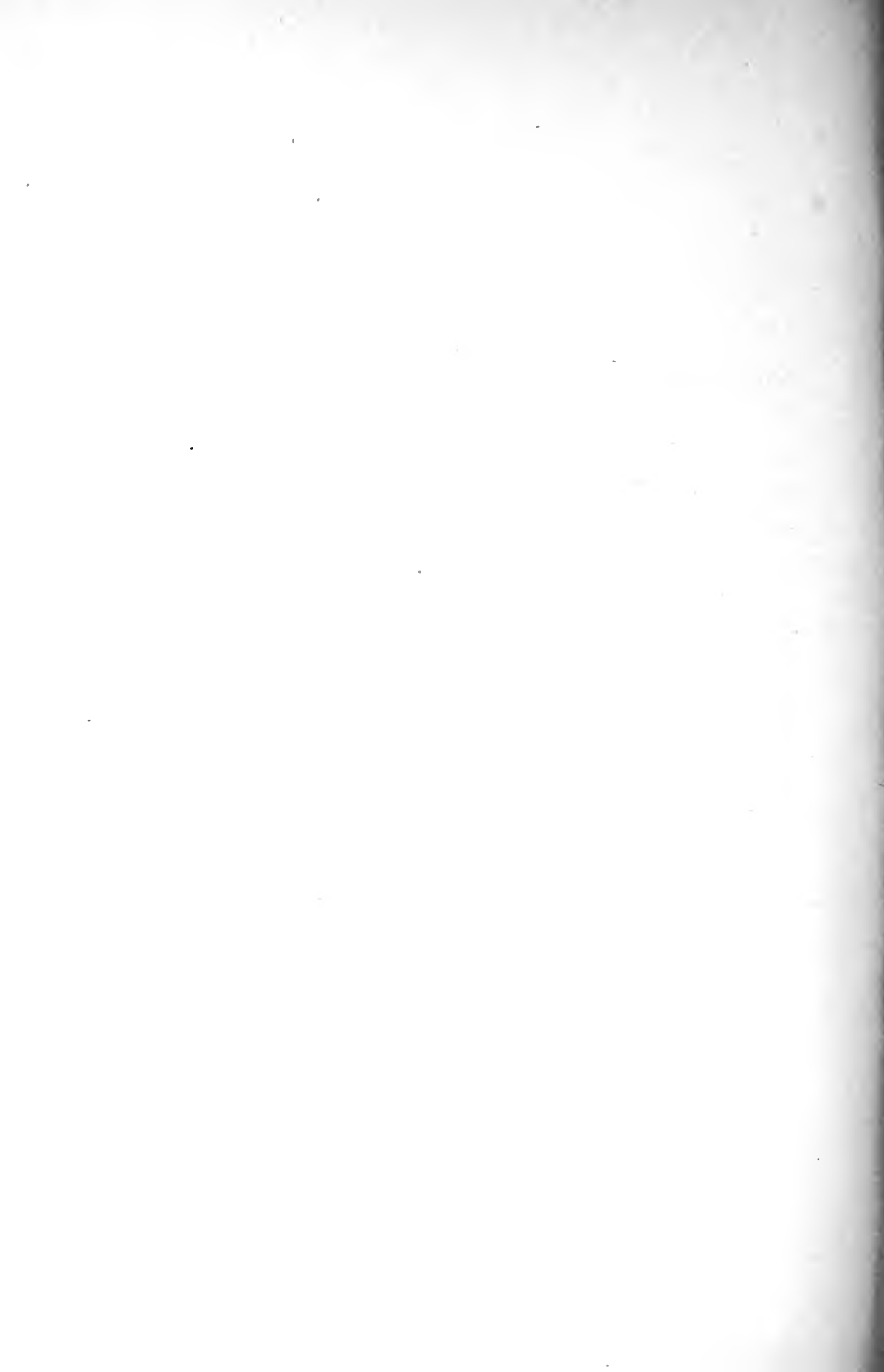
NOTE ON A TOOTH OF *ELEPHAS NAMADICUS*

BY CHARLES W. ANDREWS, D.Sc.

‘THE tooth on which Dr. ANDREWS has been kind enough to write the following note was found by a native on Bukit Besar, Nawngchik, and sold to us at Ban Sai Kau.’

This specimen seems to be of considerable interest on account of the locality in which it was found. It is an upper molar of *Elephas namadicus*, a species found in the Upper Siwalik beds, particularly in the Nabada valley. I have also received remains of this animal from Burma (near Mandalay) quite lately, but never from further south. Of course the Siwalik fauna is known to occur in Sumatra and Java, though I do not think that this particular species has been recorded from these islands. In any case, the occurrence of this tooth in the Peninsula helps to bridge over one of the gaps in the area over which the Siwalik fauna extended.

The age of *E. namadicus* was probably late Pliocene or early Pleistocene.



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DIAGNOSES OF ACULEATE HYMENOPTERA

BY LIEUT.-COLONEL C. T. BINGHAM

‘**A**S it is impossible to include in the present volume the full report on the Aculeate Hymenoptera, in which one hundred and seventy-four species are recorded, it has seemed best to publish Colonel BINGHAM’S new diagnoses in an appendix, postponing the bulk of his paper until a third zoological part of *Fasciculi Malayenses* can appear.’

FOSSORES

MUTILLIDAE

Genus **Mutilla**, Linn.

Mutilla oculata, Fabr.

Mutilla oculata, *Fabr., Syst. Piez.*, 1804, p. 452 ♀.

A pair taken in *in cop.* The male, so far as I know, has not been described.

♂. Head, thorax, and legs black, abdomen bright red, the basal four-fifths of the first and the whole of the apical segment black, wings hyaline for a third of their length from base and beyond that fuscous with in certain lights a purple sheen, the face in front, the scape of the antennae at base, the pronotum, a fringe round the scutellum posteriorly, the median segment above, and the legs covered with glistening, silvery pubescence, abdomen at base and at apex with black, on the intermediate segments with more sparse, rich golden pubescence. Head densely coarsely punctured, seen from the front broad, almost as broad as long, the vertex gently arched, the ocelli on a raised plane, the eyes emarginate on the inner side towards the top; below them the face is slightly constricted, mandibles arcuate, clypeus with a strong, broad, short medial longitudinal carina, antennae somewhat thick, the scape deeply grooved in front. Thorax densely punctured, short, broader than the head, the mesonotum with two medial and two lateral longitudinally impressed lines, scutellum conical, projecting, median segment closely punctured, broad, obliquely truncate posteriorly, above with two lateral outwardly arched and two medial V-shaped carinae running from base to apex of truncation; legs comparatively long, wings ample, the fore wing with three cubital cells, the nervures black, the tegulae large, smooth, polished, and shining. Abdomen shining, the base and apical segments closely punctured, the remaining segments smooth, with a zone of punctures beyond their middle; basal segment constricted, somewhat campanulate, with a well-marked carina beneath, this last widely but slightly emarginate in the middle; pygidium convex, bearing in the middle a slightly raised oval tubercle, which is smooth and shining.

Length, ♂, 16 to 17 mm.; *Exp.*, 30 mm.

SCOLIIDAE

Genus **Scolia**, Fabr. ; Subgenus **Discolia** (with two cubital cells in forewing).

Scolia robinsoni, sp. nov.

♀. Black, highly polished and shining, but without a trace of purple or green reflections on the head, thorax, or abdomen ; wings, dark fuscous with a brilliant purple reflection along the costal margin of the forewing, turning to brilliant metallic green on the inferior half of the fore, and on the whole of the hind wing ; the sides of the clypeus, the base of the antennae, the back of the head, the pronotum and mesonotum anteriorly, the sides of the thorax, the legs, and the abdomen, clad with stiff long black hairs, dense behind the head, on the pronotum, the legs, and the apical segments of the abdomen. Head narrower than the thorax, densely punctured between and around the bases of the antennae, remarkably smooth and unpunctured on the vertex, which is sharply sloped anteriorly ; clypeus large, convex, its anterior margin entire ; eyes remarkably small, elongate, deeply indented on the inner margins. Thorax massive, elongate, the pronotum anteriorly and on the sides, coarsely punctured ; the disc of the mesonotum, the scutellum, post-scutellum, and median segment, smooth, unpunctured ; the scutellum, postscutellum, and median segment with a gentle slope posteriorly, the last broad, its posterior angles rounded ; legs long, robust, the anterior tibial calcaria flattened, castaneous. Abdomen, long and narrow, sparsely punctured, the punctures on the apical two or three segments smaller and closer, the basal segment constricted at apex, the second segment not tuberculated above.

Length, ♀, 24 mm. ; *Exp.*, 46 mm.

Habitat. Bukit Besar, Nawngchik. 2,500 feet.

Genus **Pseudagenia**, Kohl.

Pseudagenia marpesia, sp. nov.

♀. Head and thorax, the tarsi of the anterior, the apex of the femora, the tibiae and tarsi of the intermediate and posterior legs, and the abdomen, black ; the coxae, trochanters, femora and tibiae of the anterior legs, the coxae, trochanters, and greater portion of the femora of the intermediate and posterior pair of legs, blood red ; the wings yellowish hyaline, a dark fuscous crescent-shaped cloud along the basal nervure, and a larger subapical cloud from the costal margin of the radial cell to the posterior margin of the wing ; tegulae black, nervures testaceous. Head transverse, slightly broader than the thorax, clypeus twice as broad as long, boldly arched anteriorly, face slightly concave, eyes convergent above ; thorax : the prothorax more or less cubical, the anterior angles rounded, the sides with a wide shallow groove, the posterior margin very widely arched, mesonotum flat, scutellum and postscutellum horizontal, median segment long, with a gradual slope posteriorly ; legs stout, short, the tibiae of the intermediate and posterior pair with minute spines ; abdomen fusiform, as long as the thorax. Head and thorax opaque, minutely and closely punctured, and covered with sparse very fine short silky pubescence, the sides of the postscutellum and metapleura finely, obliquely striate, the median segment somewhat more coarsely punctured than the rest of the thorax, and in the middle minutely reticulate ; abdomen, smooth and shining.

Length, ♀, 13 mm. ; *Exp.*, 22 mm.

Habitat. Bukit Besar, Nawngchik.

Genus **Ceropales**, Latr.**Ceropales ligea**, sp. nov.

♀. Black, the clypeus, a spot in the emargination of the eyes, a narrow line behind them, the anterior angles of the prothorax, a line on its posterior margin, the postscutellum, the posterior lateral lower angles of the median segment, a spot on the front of all the coxae, the apex of the femora of the anterior legs behind, the apex of the femora of the intermediate legs in front, a line broadly interrupted in the middle on abdominal segments one to four and the whole of the sixth segment above ivory white, the tibiae and basal joint of the tarsi of the anterior legs testaceous red with a line of black above, the femora except at the extreme apex of the posterior pair of legs blood red, the calcaria of all the legs except the inner one on the posterior legs ivory white; wings clear hyaline, slightly fuscous towards their apical margins. Head, thorax, and abdomen shining with a silky lustre, very minutely rugulose. Antennae dull black, setaceous, the scape and basal joint of the flagellum in front ivory white.

Length, ♀, 6 mm. ; *Exp.*, 12 mm. ; *Exserted sting*, 1.5 mm.

Habitat. Sungkei, South Perak.

In a collection of Burmese Hymenoptera, which I have not yet worked out, there are two females of this species.

SPHEGIDAEGenus **Cerceris**, Latr.**Cerceris annandali**, sp. nov.

♂. Head, thorax, and abdomen black, a spot at the base of the mandibles, the clypeus, a triangular spot above it, the sides of the face, a short line on the scape in front, a small spot behind the eyes, a line broadly interrupted in the middle on the posterior margin of the pronotum, the postscutellum, a spot on the anterior upper angles of the median segment, a larger triangular spot on each side of the apex of the same, the femora and tibiae in front and the basal joint of the tarsi of the anterior and intermediate legs, the coxae above, a line on the femora and tibiae in front, and the basal joint of the tarsi of the posterior legs, a fine line broadening laterally along the margin of the third abdominal segment above, a triangular spot on each side of the second ventral segment and a quadrate spot on each side of the third ventral segment bright lemon yellow; wings hyaline, shaded with dark fuscous along the costal margins of the forewing. Head, thorax, median segment, and first abdominal segment somewhat coarsely punctured, but shining not opaque, rest of the abdomen smooth, shining and highly polished. The punctures are partly effaced on the clypeus and face in front. Head broad, broader than thorax, inner orbits of the eyes nearly parallel, a sharp short vertical carina between the antennae; the first abdominal segment long, cylindrical, attenuated to form a pedicel, the pygidial area flat, minutely punctured.

Length, ♂, 12 mm. ; *Exp.*, 22 mm.

Habitat. Biserat, Jalor.

ANTHOPHILA**APIDAE**Genus **Halictus**, Latr.**Halictus validus**, sp. nov.

♀. Black, the apex of the antennae and the femora, tibiae and tarsi of the legs rufo-piceous, the latter with bright yellowish-brown pubescence, the face in front and the sides of the thorax with whitish hoary pubescence, the abdomen covered sparsely with jet black rather stiff hairs. Head

narrower than the thorax, somewhat flat and transverse, the mandibles smooth and shining, the clypeus and front finely punctured, the latter with a very fine vertical carina; eyes large, convergent anteriorly; thorax very broad and massive, the mesonotum slightly convex and finely reticulated; the scutellum, post-scutellum, and median segment very coarsely reticulate, the last posteriorly, abruptly truncate and strongly margined; wings hyaline and iridescent, nervures testaceous, tegulae castaneous with a light yellowish spot in the centre; abdomen, except for the sparse covering of black hairs, smooth and shining, especially on the basal segment.

Length, ♀, 7-8 mm.; *Exp.*, 13 mm.

Habitat. Biserat, Jalor.

This species resembles *B. intricatus*, VACHAL, but is much more stoutly built and has no white pubescent bands on the abdomen.

Genus **Anthidium**, Fabr.

Anthidium minutissimum, sp. nov.

♀. Black, the mandibles, the clypeus, sides of the face as high as the base of the antennae, an abbreviated line behind the eyes above, a spot on the sides of the pronotum, the anterior lateral angles of the mesonotum, a broad margin posteriorly to the scutellum, a large spot on each side of the basal abdominal segment, a line on the third segment widely interrupted in the middle, a line on the fourth and fifth and the whole of the apical segment above yellow; the abdomen beneath castaneous, paling to yellow on the apical margins of the segments; legs, dark castaneous, the tibiae and tarsi of the anterior and intermediate, and the tarsi only of the posterior legs, yellow; wings, hyaline and iridescent, nervures dark brown, tegulae black. Head, thorax, and abdomen very densely punctured and opaque, the punctures on the abdomen somewhat finer and more shallow than on the thorax.

Length, ♀, 4-4.1 mm.; *Exp.*, 7.5 mm.

Habitat. Biserat, Jalor.

Genus **Melipona**, Illiger; Subgenus **Trigona**

Melipona castanea, sp. nov.

Worker. Light rather dull chestnut, shaded with fuscous black on the vertex of the head and the mesonotum, the margins of the abdominal segments broadly dark brown, the vertex, the margins of the mesonotum and scutellum, the thorax beneath and on the sides, the margins of the tibiae and tarsi, the apical three segments of the abdomen above and the apical four beneath covered with very stiff long black hairs; the clypeus and face in front, and the median segment posteriorly with very short somewhat dense light brownish pubescence, which in one specimen covers also the mesonotum, the pro-, meso-, and metapleurae; wings, hyaline yellowish for half their length from base. Head broader than the thorax, clypeus with its anterior margin transverse; mesonotum slightly convex; scutellum gibbous, rounded, and projecting posteriorly over the median segment; abdomen broader than the thorax and about half as long as the head and thorax united. Head, thorax and abdomen beneath the pubescence smooth, polished and shining.

Length, worker, 7 to 9 mm.; *Exp.*, 16 to 20 mm.

Habitat. Bukit Besar, Nawngchik. 1,500 to 2,500 feet.

Melipona basimaculata, sp. nov.

♂. Black, the coxae and trochanters of the intermediate and posterior legs, the base of the first abdominal segment above, and the basal four ventral segments white. Head, thorax, and legs on the outside clothed with fuscous brown pubescence with a mixture of longer hairs of the same colour, the inside of the tarsi with dense, bright ferruginous pubescence, the outside of the posterior tibiae and the apex of the abdomen with sparse long black bristles; the cerci testaceous; wings hyaline, nervures and tegulae dark brown. Head and thorax finely and somewhat densely punctured; the median segment above rather more sparsely punctured, the legs rather more coarsely punctured on the outside, the flattened, but slightly convex tibiae of the posterior legs bearing on the outside minute piliferous tubercles; abdomen, the basal two segments smooth, highly polished and shining, remaining segments finely and closely punctured, basal segment concave anteriorly.

Length, ♂, 7.5 to 8 mm.; *Exp.*, 17 mm.

Habitat. Biserat, Jalor; Telôm, Perak-Pahang boundary, 4,000 feet.

LIST OF WATER BEETLES FROM THE PATANI STATES

BY D. SHARP, M.A., F.R.S.

DYTISCIDAE. *Cybister guerini*; *C. sugillatus*; *C. dehaani*; *Eretes sticticus*; *Hydaticus bivittatus* (four specimens, of which one is a variety); *H. rhantoides*; *Lacconectus basalis*; *Agabus dissimilis*; *Copelatus pusillus*.

GYRINIDAE. *Porrorynchus marginatus*; *Dineutes unidentatus*; *D. subspinus*; *Orctogyrus discifer*; *Stexothus cavisternum*; *Sternolophus rufipes*; *Berosus*, sp. nov. (?)

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